COMPRES

Lessons from CHiPR and COMPRES

Bob Liebermann

At

INCREASE Workshop

National Synchrotron Light Source of BNL

14 July 2010

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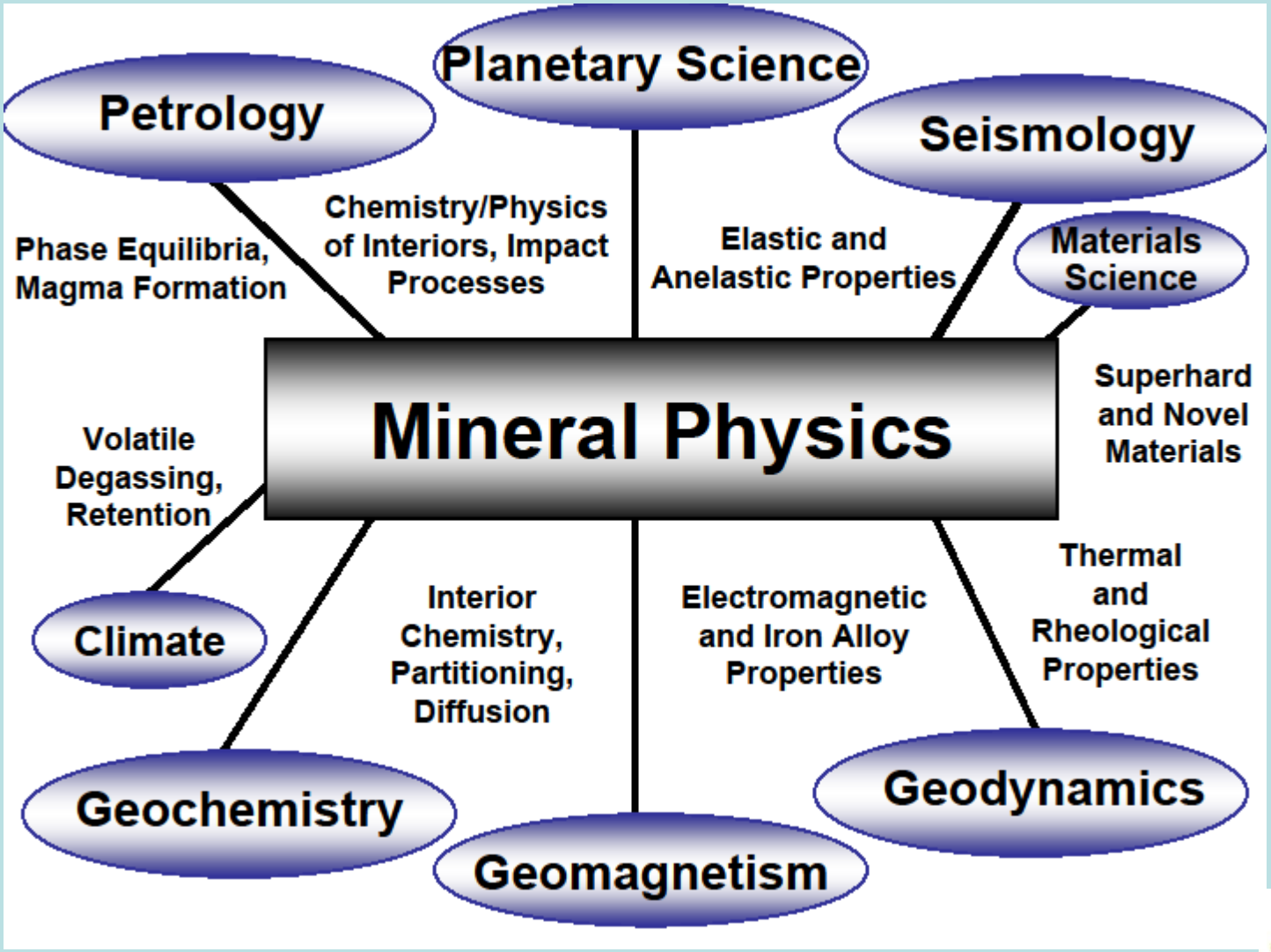
Planetary Science
Petrology
Seismology
Chemistry/Physics of Interiors, Impact Processes
Phase Equilibria, Magma Formation
Elastic and Anelastic Properties
Materials Science
Mineral Physics
Superhard and Novel Materials
Volatile Degassing, Retention
Climate
Interior Chemistry, Partitioning, Diffusion
Electromagnetic and Iron Alloy Properties
Thermal and Rheological Properties
Geochemistry
Geodynamics
Geomagnetism

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Background to CHiPR

- 1976-1986: Liebermann, Prewitt and Weidner-colleagues at Stony Brook
- 1986: Prewitt Director of Geophysical Lab
- 1987: Navrotsky move from ASU to Princeton
- 1988: NSF announced new STC Program

  "To help US compete with Europe and Japan in science and technology"

  —President Reagan

1991: Establish CHiPR

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CHiPR [1991-2002]
Center for High Pressure Research

A NSF Science and Techology Center [STC]

One of 14 new centers in 2nd round of STC competition.

Mineral Physics Institute of Stony Brook University [HQ]
[Donald Weidner and Robert Liebermann]

Geophysical Laboratory of Carnegie Institution of Washington
[Charles Prewitt]

Thermochemistry Laboratory of Princeton University
[Alexandra Navrotsky]

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CHiPR [1991-2002]
Center for High Pressure Research

Goals of CHiPR

- Science
- Technology
- Education

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CHiPR [1991-2002]
Center for High Pressure Research

The Center for High Pressure Research (CHiPR), received funding from the National Science Foundation from February, 1991 to January, 2002 as one of the NSF Science and Technology Centers. CHiPR's goals were scientific, technological, and educational.

CHiPR was guided by two central scientific objectives: (1) to understand the deep interiors of planets, especially the Earth's mantle and core, through quantitative study of the materials likely to be present in such environments, and (2) to use pressure as a probe of the structure, bonding, energetics, and physical properties of solids to improve fundamental understanding of high-pressure chemical and physical phenomena.

We seek to advance high-pressure technology in both diamond-anvil cell and multi-anvil high-pressure, high-temperature environments, to use and improve the application of synchrotron radiation to high-pressure studies, and to develop in situ and ex situ characterization methods compatible with microscopic high-pressure samples.

We are committed to a strong educational component for a community diverse in its needs and demographics. We provide continuity and flexibility for external and internal collaborations in our unique laboratories, and we engage in outreach programs to a varied community in academia, federal laboratories, industry, and the general public.

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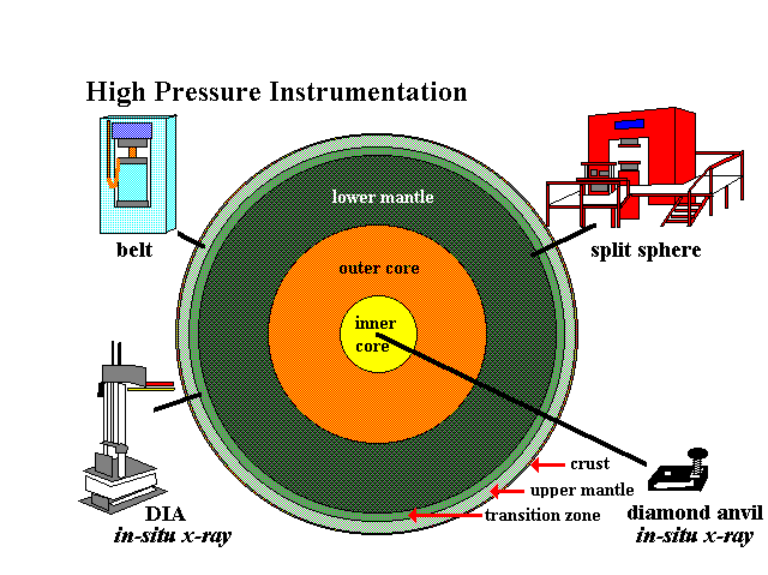
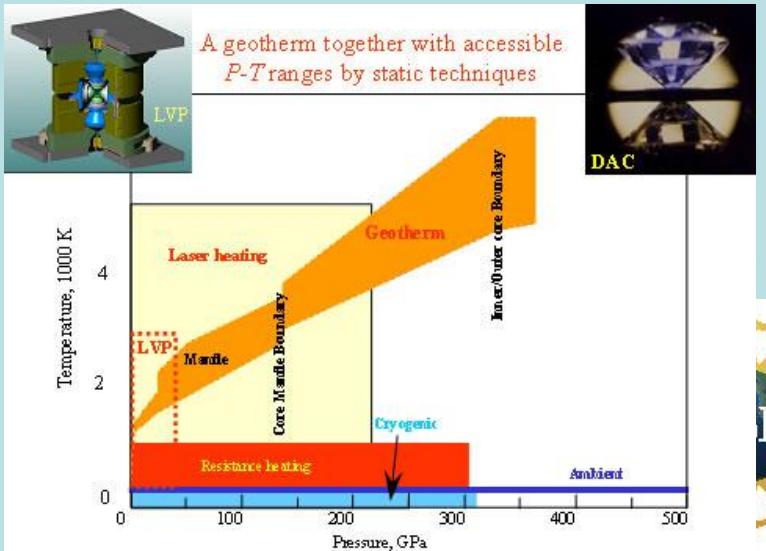
Science Goals of CHiPR

Understand deep interiors of planets through study of materials using experiments and theory



•Use pressure as a probe of structure, energetics and physical properties of solids



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Technology Goals of CHiPR

• Advance diamond-anvil high-pressure apparatus

•Advance multi-anvil high-pressure apparatus

Education Programs of CHiPR

- REU Summer Scholars
- High school honors Earth Science
- Project WISE—Women in Science and Engineering
- Project Java
- Summer Educational Interns
- “Let’s Make Diamonds”-hands on

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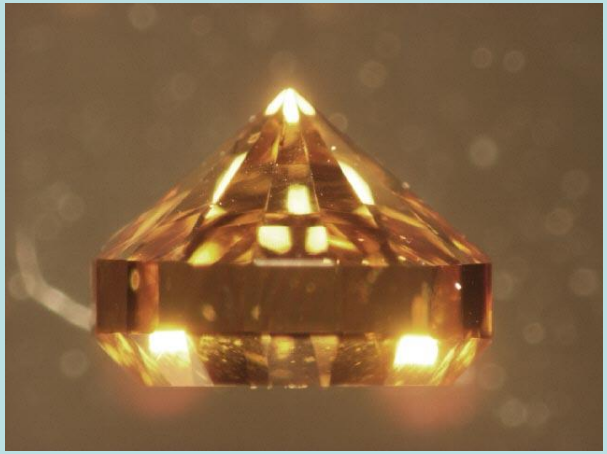
Education Goals of CHiPR

- REU Summer Scholars

- "Let's Make Diamonds"



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Challenges in getting CHiPR started

- Convincing people to work together,
  even those from same institution

- Setting agenda: Top-down or bottom up

- Establishing and maintaining focus on major goals

- Addressing E & O objective of NSF top floor

- Preparing for attacks/jealousy of colleagues

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Achievements of CHiPR [1991-2002]

- Develop new technologies for both diamond-anvil and multi-anvil high-pressure experiments
- Exploit new synchrotron sources of X-rays
- Discover new high-pressure materials of interest to both Earth sciences and materials science
- Expand knowledge of the behavior of materials at elevated pressures and temperatures

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From CHiPR to COMPRES

- CHiPR was an “elitist” club of entrepreneurs
- Important need to “level the playing field
- Broaden the mineral physics community and develop the younger age base
- Diversity funding for mineral physics

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Consortium for Materials Properties Research in Earth Sciences

Funded by NSF Division of Earth Sciences [2002-2012]

Headquarters in Mineral Physics Institute
at Stony Brook University
May 2003 to June 2010

Mission

- COMPRES is a community-based consortium whose goal is to enable Earth Science researchers to conduct the next generation of high-pressure science on world-class equipment and facilities. It facilitates the operation of beam lines, the development of new technologies for high pressure research, and advocates for science and educational programs to the various funding agencies

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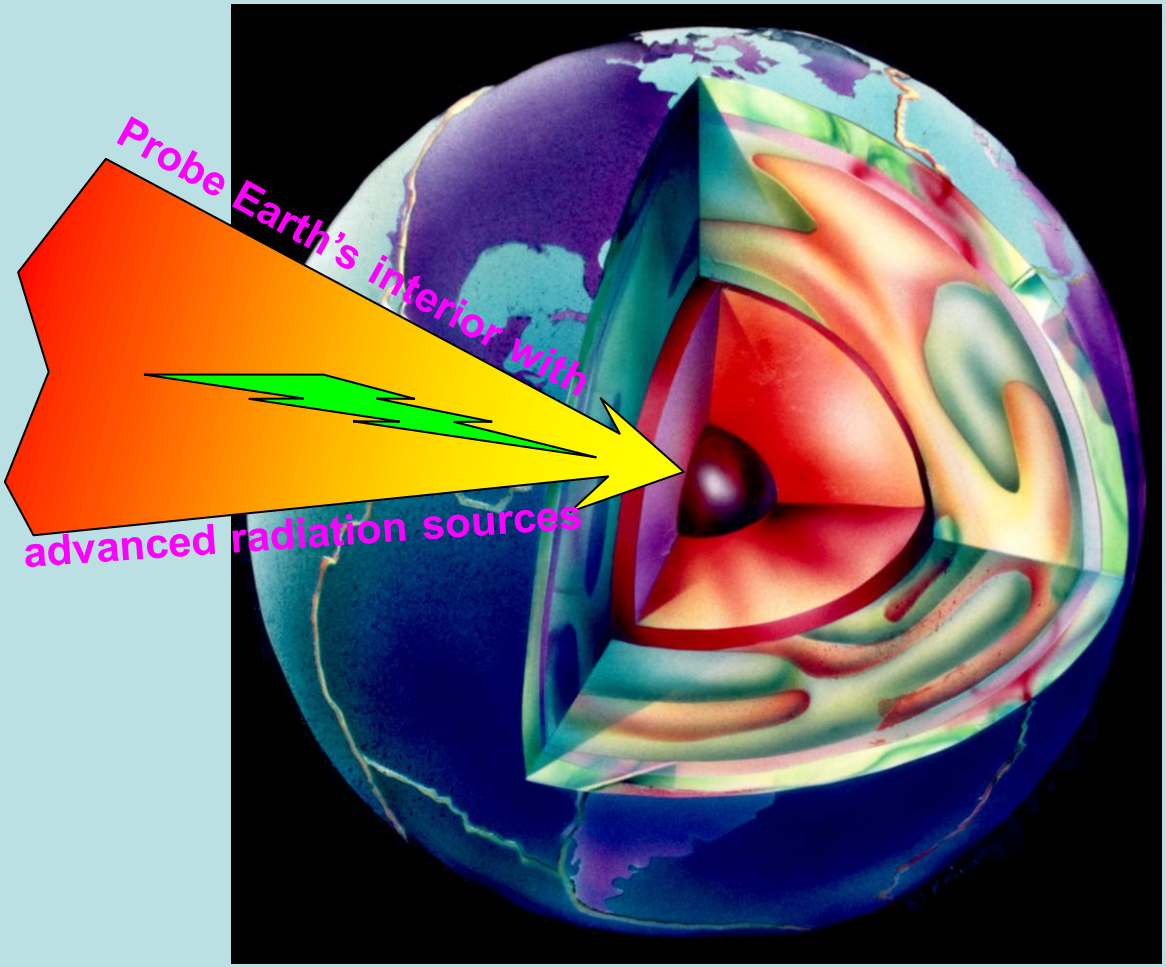
COMPRES: Consortium for Materials Properties Research in Earth Sciences



X-ray and Neutron Community Facilities
Infrastructure Development Projects

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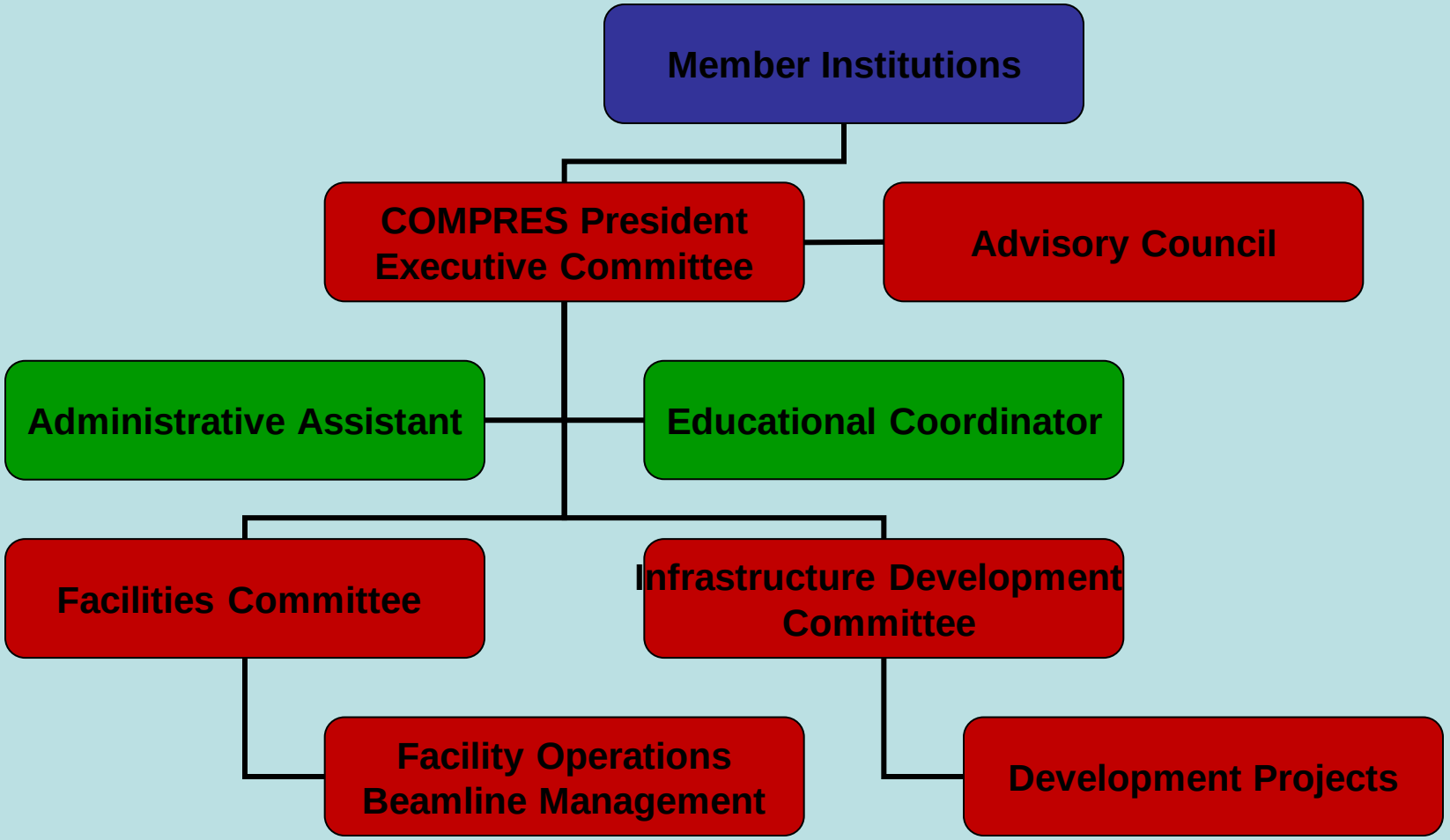
Organization



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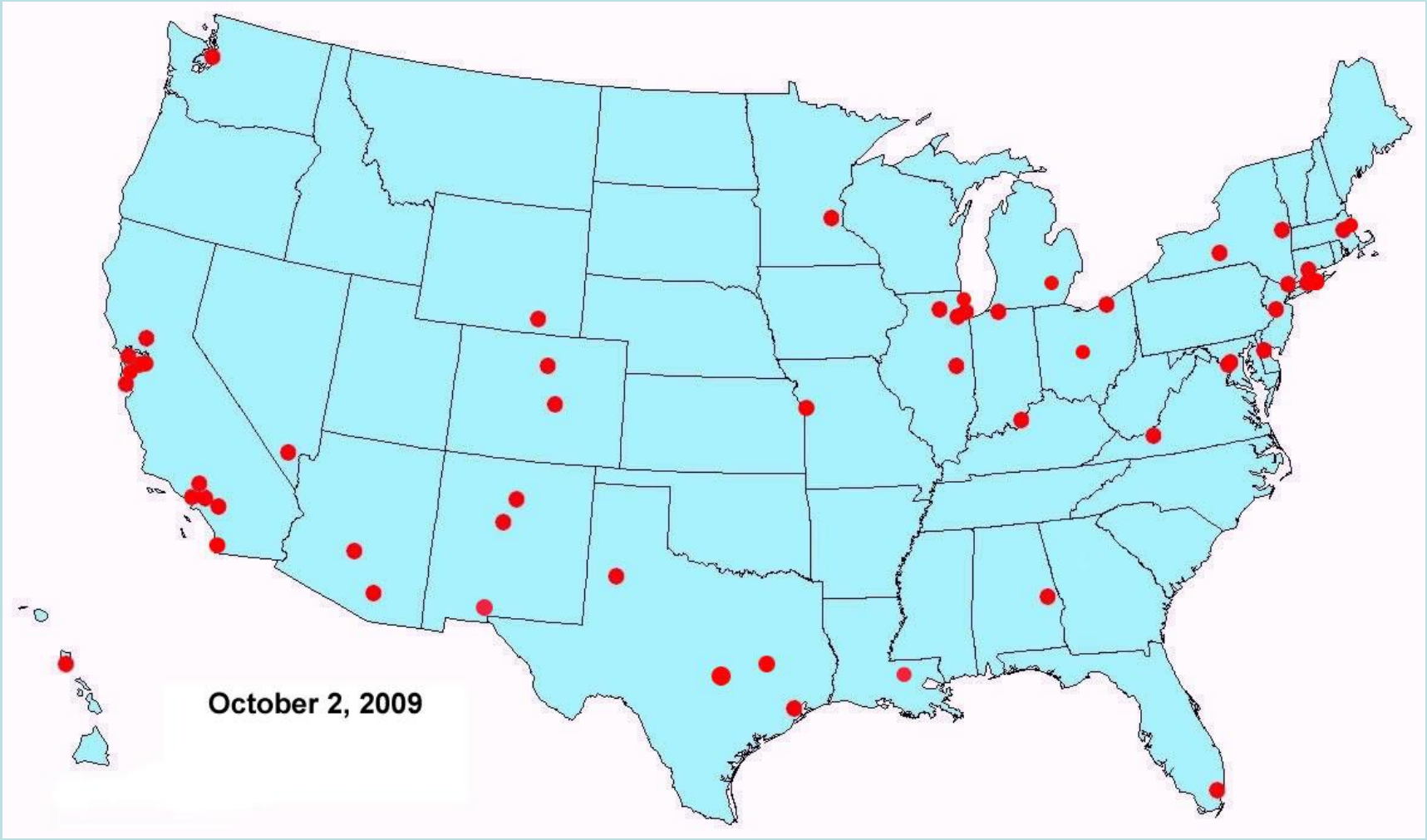

56 U. S. Members + 39 Foreign Affiliate Members

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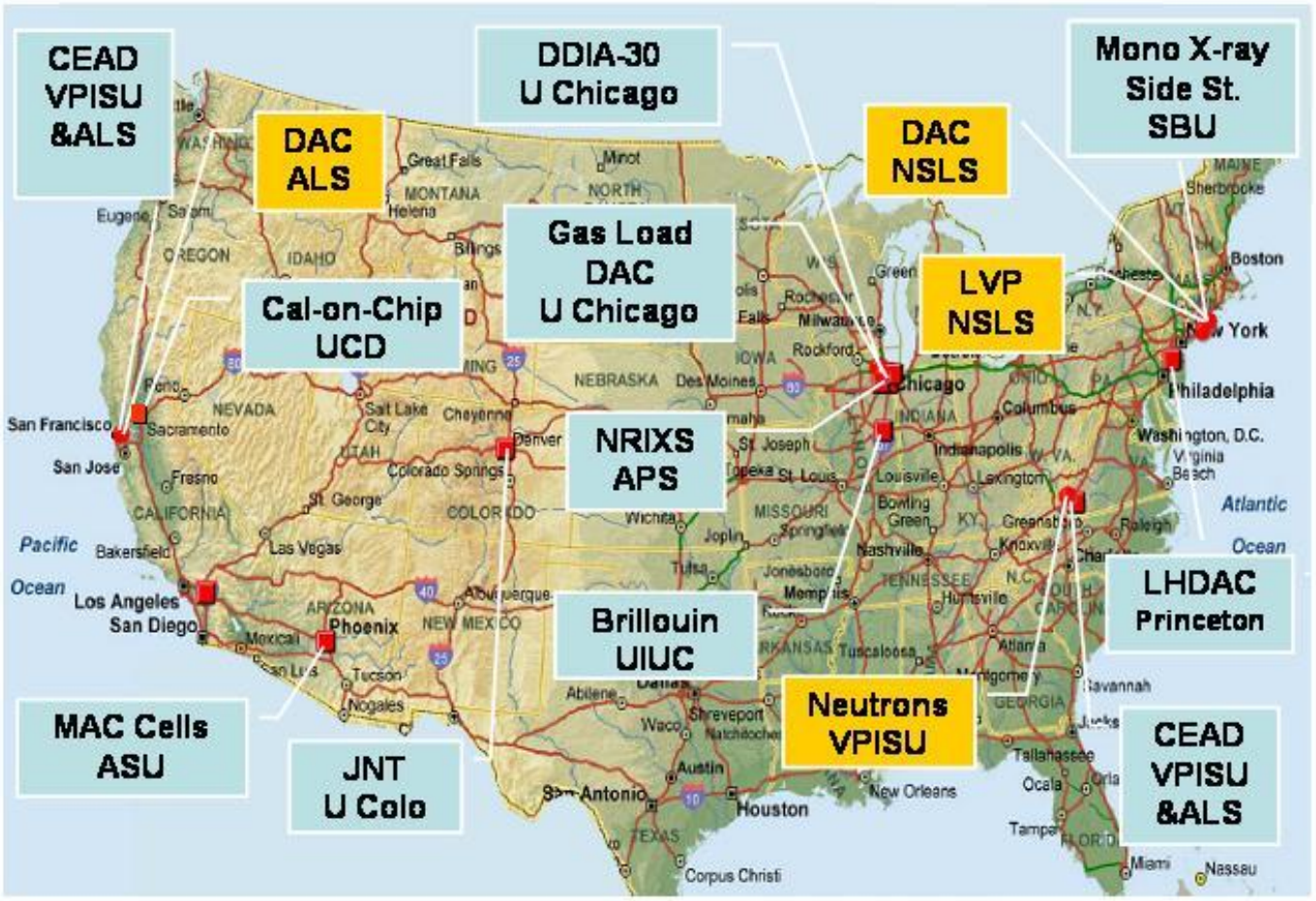

COMPRES Sites for Community Facility [Yellow] and Intrastructure Development Projects [Blue]

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NSLS

NATIONAL SYNCHROTRON LIGHT SOURCE

At the Brookhaven National Laboratory

Advanced Light Source at the
Lawrence Berkeley National Laboratory

Advanced Photon Source at the Argonne National Laboratory

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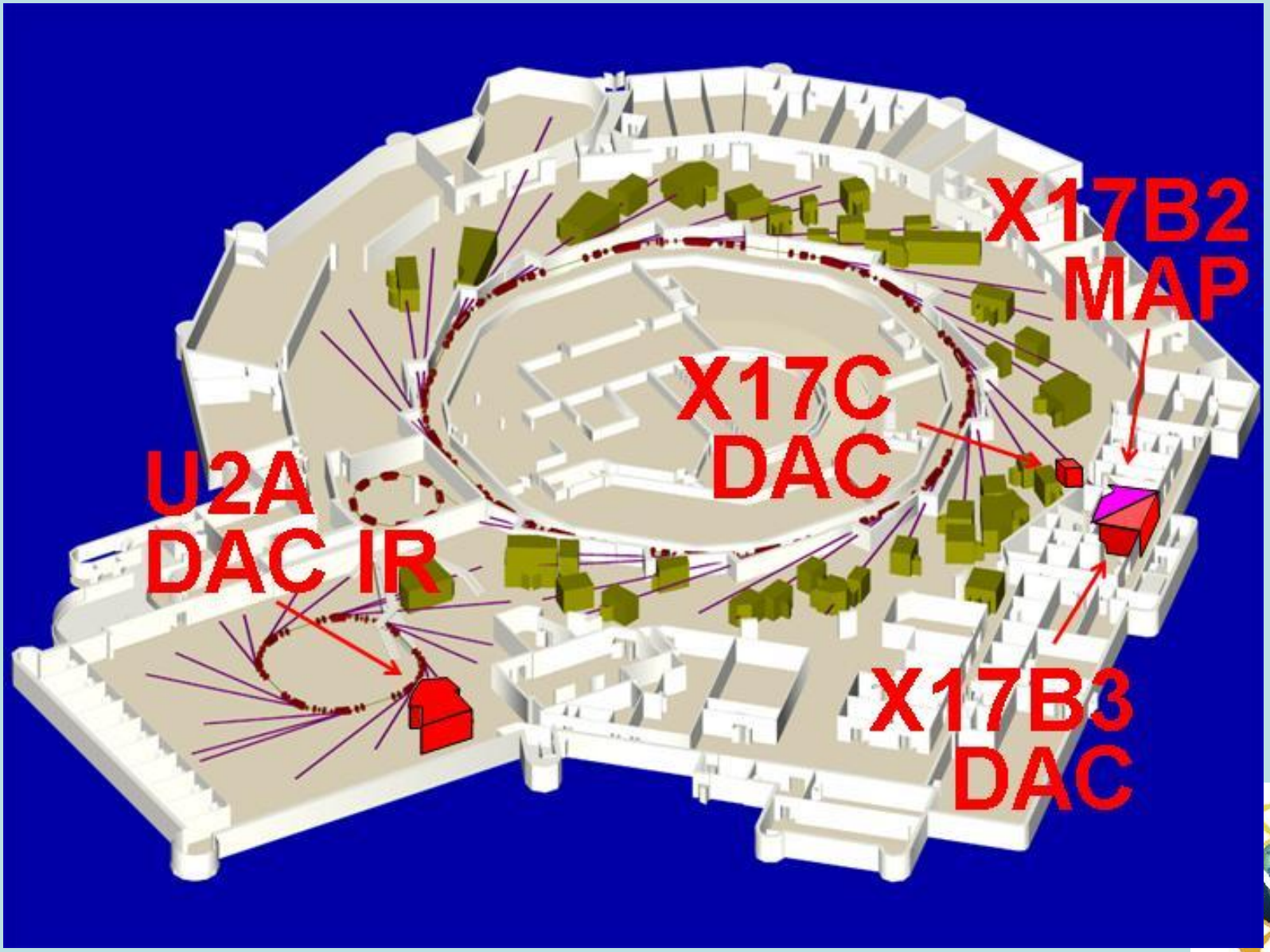
High-pressure beamlines operated by COMPRES at the NSLS



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Anat Shahar and Nathalie Conil of the research team of Abby Kavner from UCLA working at X17C beamline of the NSLS under the tutelage of Jingzhu Hu

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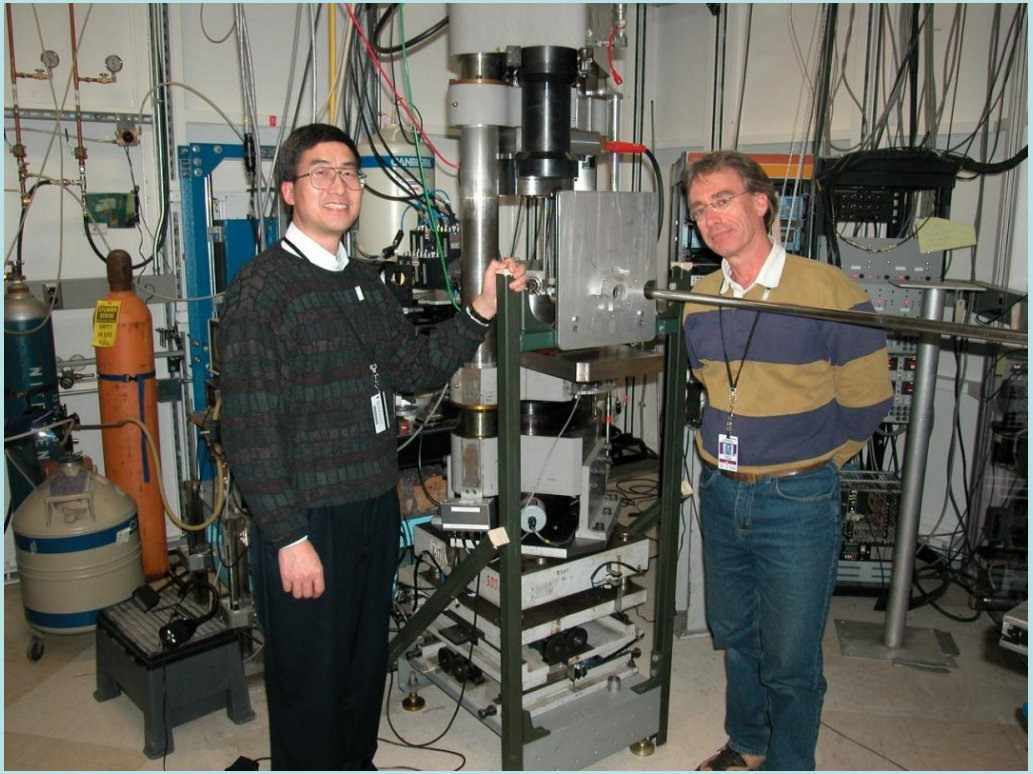
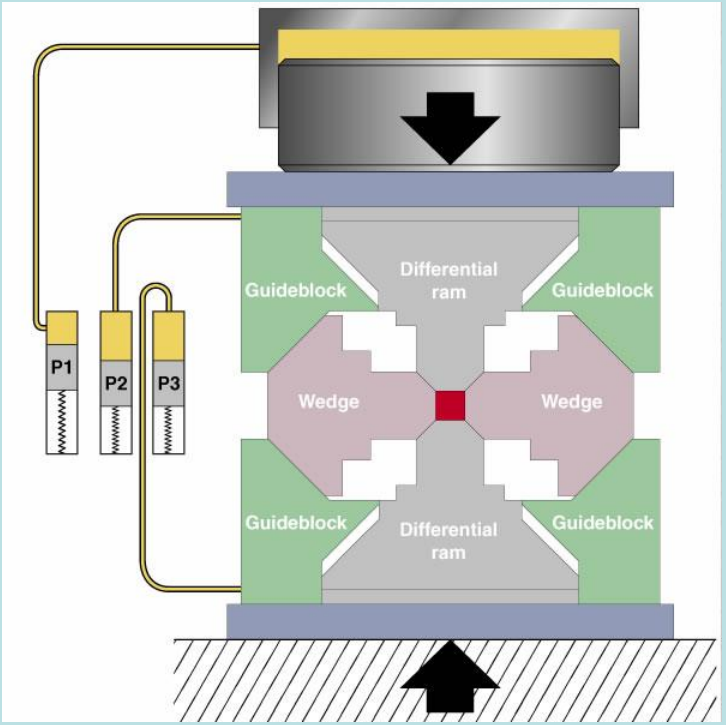
D-DIA Apparatus [SAM-85] at X17B2 Beamline at the NSLS





Deformation-DIA apparatus

Shenghua Mei-Minnesota and Bill Durham-MIT

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REU Summer Scholars at X17B2
Multi-Anvil Beamline of the NSLS in 2004

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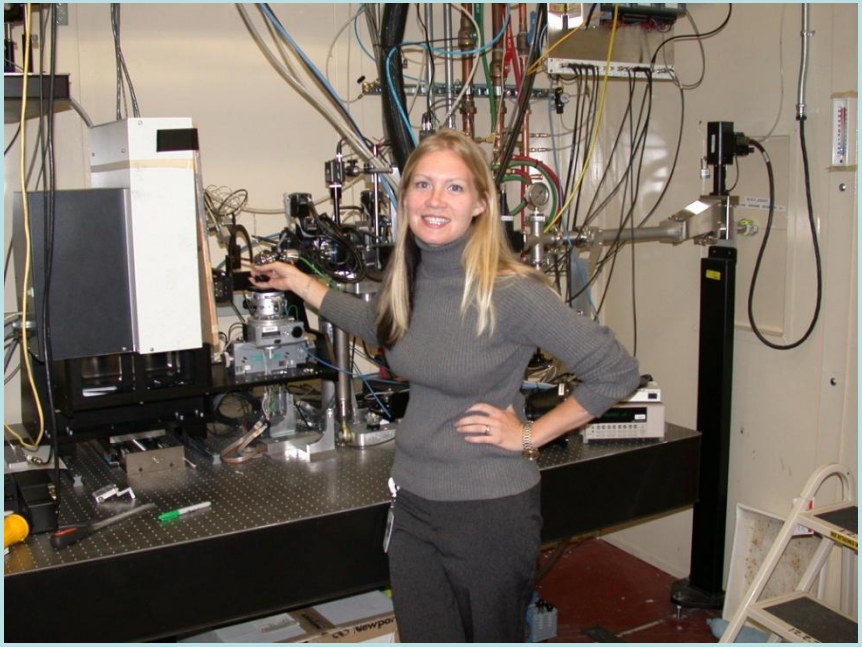
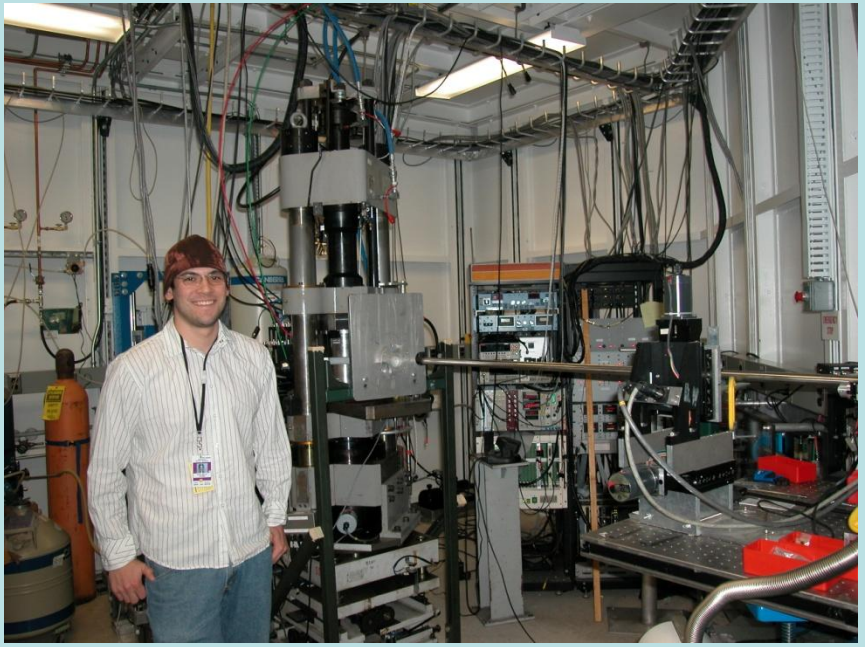
COMPRES undergraduate student interns





Undergraduate Interns Arianna Gleason from University of Arizona
at beamline 12.2.2 of the ALS and Christopher Young from University of CaliforniaDavis at the X17B2 beamline at the NSLS in 2004-2005

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Beamline 12.2.2 at ALS

COMPRES users start using beamline 12.2.2 at the ALS

Although commissioning of the new high-pressure beamline at the ALS is not due to be completed until the end of the year COMPRES users have already started collecting diffraction data. Below are pictures Abby Kavanar and Nathalie Conil from UCLA collecting radial diffraction data on water samples. End station 1, equipped with resistive heating dacs, is now fully commissioned for diffraction experiments. End station 2, equipped with laser heating, will be commissioned for diffraction next month. Updates and details of how to obtain beam time on this new facility can be found on the beam line website: http://xraysweb.lbl.gov/bl1222/home.htm.

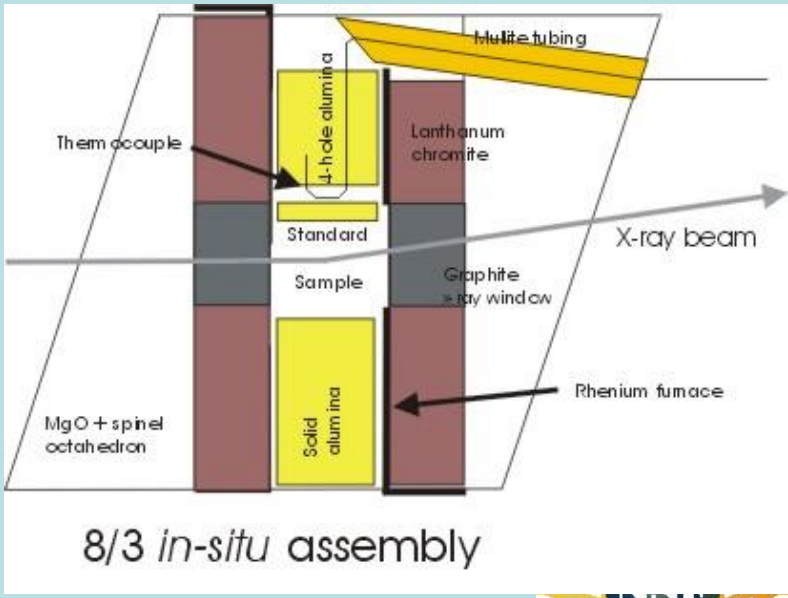
Abby Kavner and Nathalie Conil from UCLA

COMPRES Sites for Community Facility [Yellow] and Infrastructure Development Projects [Blue]

Multi-anvil cell development project at ASU
[PIs: Leinenweber, Tyburczy and Sharp]

Mini-lathe for production of cell assemblies

Machinist Brian with Kurt Leinenweber



8/3 *in-situ* assembly

Mark Rivers and new gas-loading system for diamond-anvil cells constructed at the GSECARS beamlines at the APS with support of COMPRES and GSECARS.

COMPRES

Education & Outreach

- Annual Meeting
- Newsletters
- Workshops
- Website renovation
- Distinguished Lecturer Series
- Publications in Mineral Physics
- Teaching Mineral Physics across the Curriculum

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2009 Annual Meeting of COMPRES
June 19-22, 2009
Mt. Washington Resort, Bretton Woods, New Hampshire
113 Attendees—of whom 27 were graduate students

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Semi-Annual Newsletters of COMPRES
Edited by Jiuhua Chen from Florida International University

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Schools & Workshops

Training next generation of scientists

Development new techniques

Advancing the field of mineral physics

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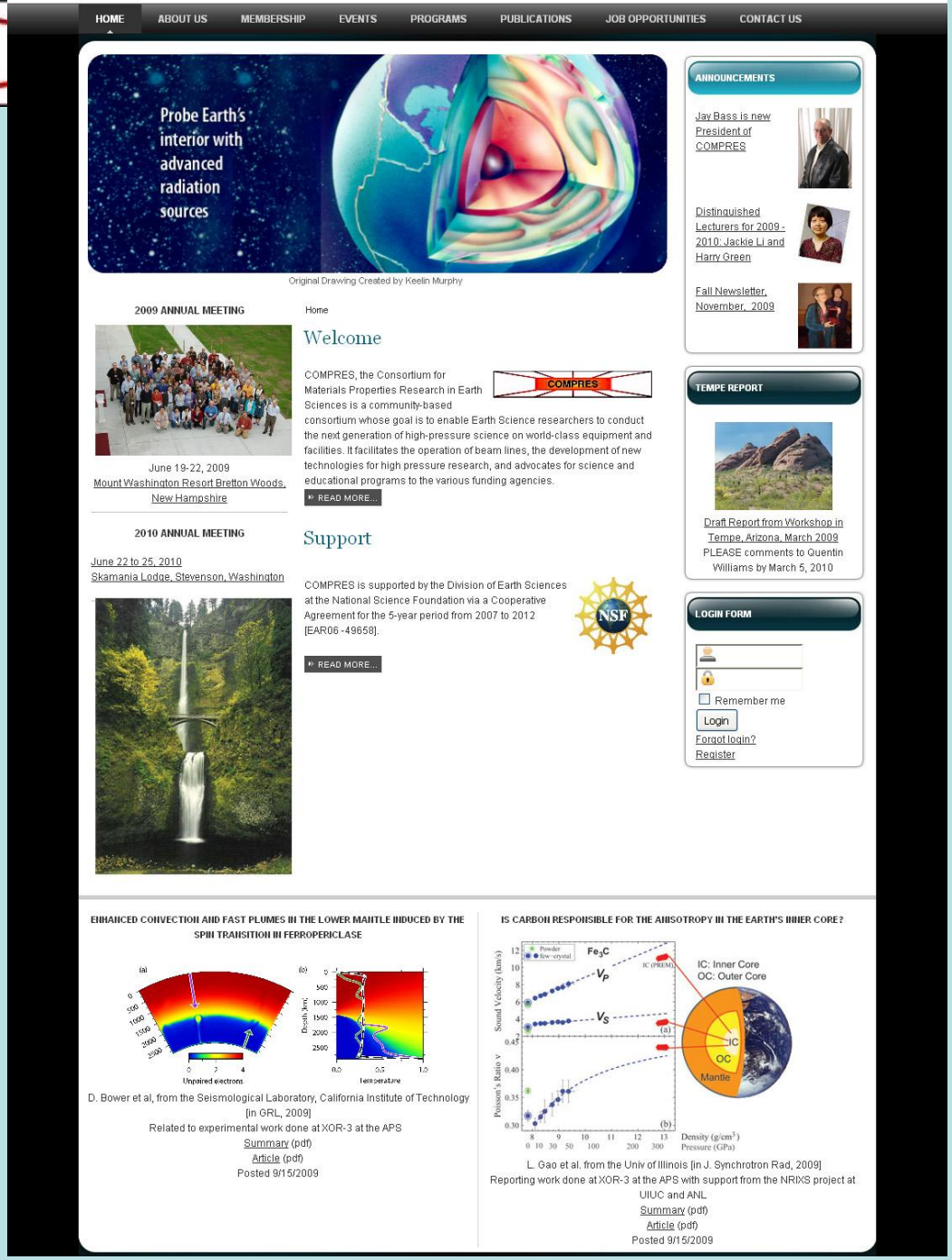
On-line Brillouin Spectroscopy at GSECARS: Basic Principles and Application for High Pressure Research
GSECARS, Advanced Photon Source
September 23-25, 2009



New COMPRES Website created by LB Designs 2009-2010

www.compres.us

COMPRES Distinguished Lecturers for 2010-2011

Wendy Panero
The Ohio State University

"Anisotropic Fabric of the Earth's Inner Core"

"Water Cycling and Storage in the Earth's Deep Interior"

James Van Orman
Case Western Reserve University

"Chemistry at the core-mantle boundary"

"Diffusion in Earth's deep interior: Insights"

Please contact COMPRES to apply for a visit.
COMPRES will cover all costs.

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BELIN sup
Géophysique
L'intérieur de la Terre et des planètes
Agnès DEWAELE
Christine SANLOUP
Elements
An International Magazine of Mineralogy, Geochemistry, and Petrology
User Research Facilities in the Earth Sciences
User Facilities around the World
Synchrotron Radiation, Neutron, and Mass Spectrometry Techniques
Scientific Advances Made Possible by User Facilities
Accessing User Facilities
New Opportunities at Emerging Facilities
CSEDI
2004
Cooperative Studies of the Earth's Deep Interior
• DEVELOPMENTS
• DISCOVERIES
• FUTURE
Advances in HIGH-PRESSURE TECHNOLOGY FOR GEOPHYSICAL APPLICATIONS
Edited by
J. Chen, Y. Wang, T.S. Duffy, G. Shen and L.F. Dobrzhinetskaya
Journal of Synchrotron Radiation
Volume 12
Part 5
September 2005
Editors: Å. Kvick, D. M. Mills and T. Ohta
Structure Determination by Single-Crystal X-ray Diffraction at Megabar Pressures
Guest Editors: P. Dera, C. T. Prewitt and S. D. Jacobsen
International Union of Crystallography
IoP
Journal of Physics
Condensed Matter

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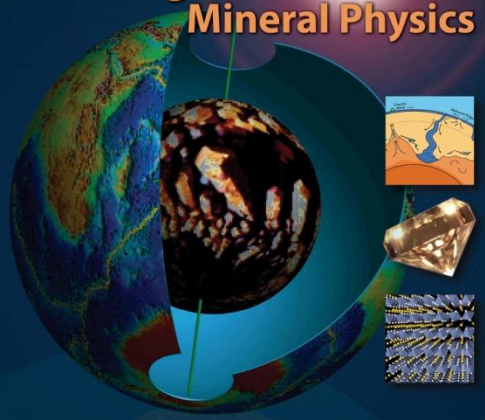
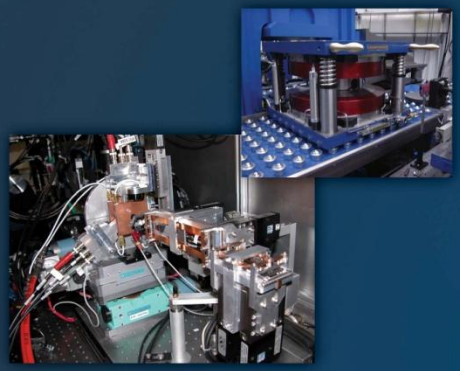
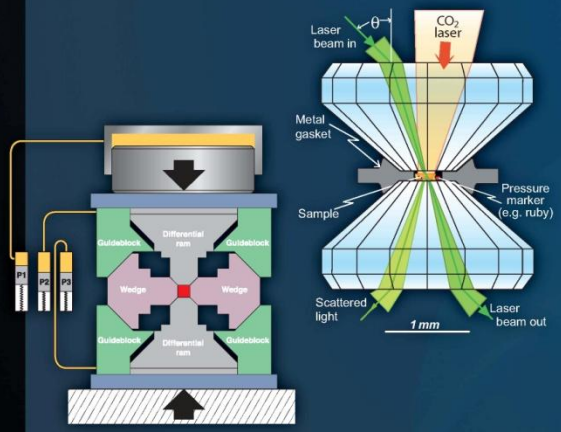
Current and Future Research Directions in

High-Pressure Mineral Physics



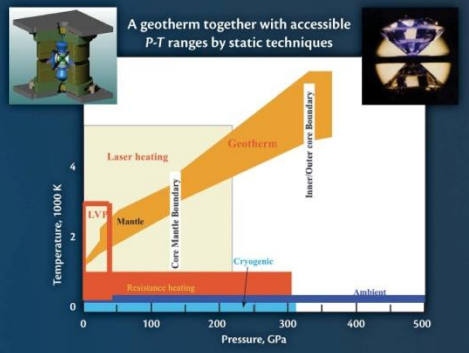
The field of high-pressure mineral physics is highly interdisciplinary, encompassing the full range of chemical and physical (even biological) processes that take place at high pressures beneath the surfaces of planets. These processes span the range of conditions within Earth's interior, from generation of the magnetism in Earth's core at pressures of over 1.3 million atmospheres, to methane production by microbes at modest pressures in ocean sediments.

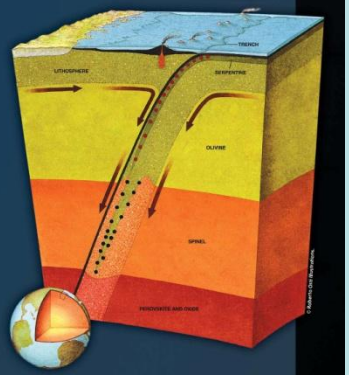




Technology

Inventing new tools to understand Earth and the deep interiors of other planetary bodies.





Science

Understanding how planetary systems operate and their evolution over time.

COMPRES

Consortium for Materials Properties Research in Earth Sciences

A community-based organization to promote and facilitate high-pressure research in the science of Earth and planetary materials. COMPRES operates high-pressure beamlines for Earth sciences at national synchrotron and neutron facilities and supports the development of new technologies for high-pressure research. COMPRES is funded by the National Science Foundation Division of Earth Sciences. Copies of the report, "Current and Future Directions in High-Pressure Mineral Physics," are available at www.compres.us.

Poster based on Bass Report

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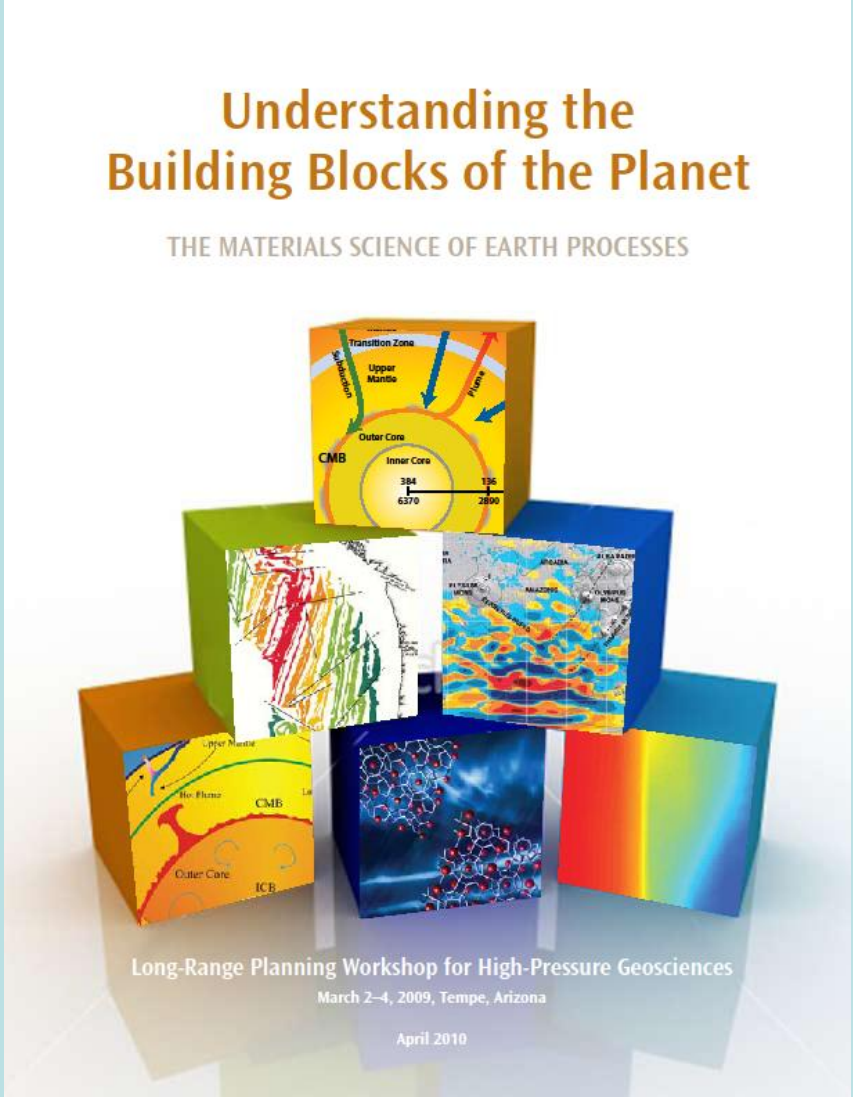
“Tempe Report” from Mineral Physics Community--2010



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Dave Mogk from Montana State University demonstrating the new module on “Teaching Mineral Physics across the Curriculum” to Joseph Smyth, Thomas Sharp and James Tyburczy at 2009 Annual Meeting of COMPRES in Bretton Woods, New Hampshire.

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Career Path for African-American Students from HBCUs to National Laboratories

*MS in Geoscience Instrumentation at Stony Brook University
*Research Internship at NSLS of Brookhaven National Laboratory
*Collaborate with:
INCREASE: Interdisciplinary Consortium for Research and Educational Access in Science and Engineering*
Center for Inclusinve Education at Stony Brook

July 2008 INCREASE Workshop at National Synchrotron Light Source

Special “field trip” on July 16
12:00 to 3:00 PM

Tour labs of Mineral Physics Institute at Stony Brook University


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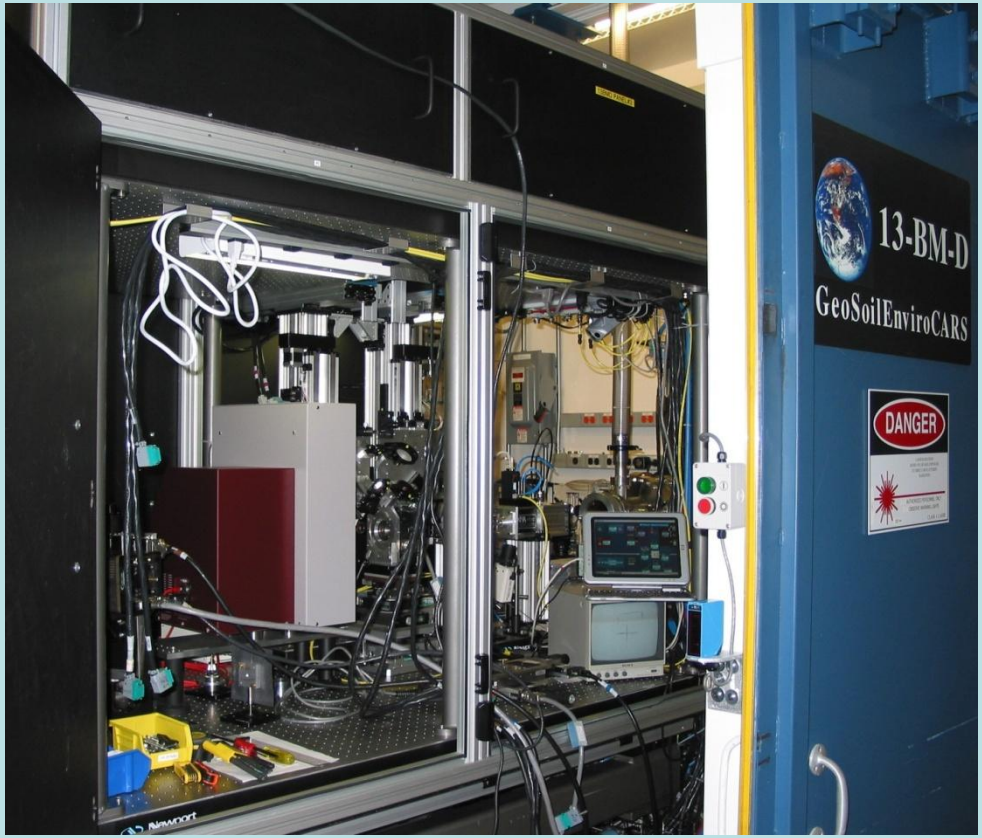
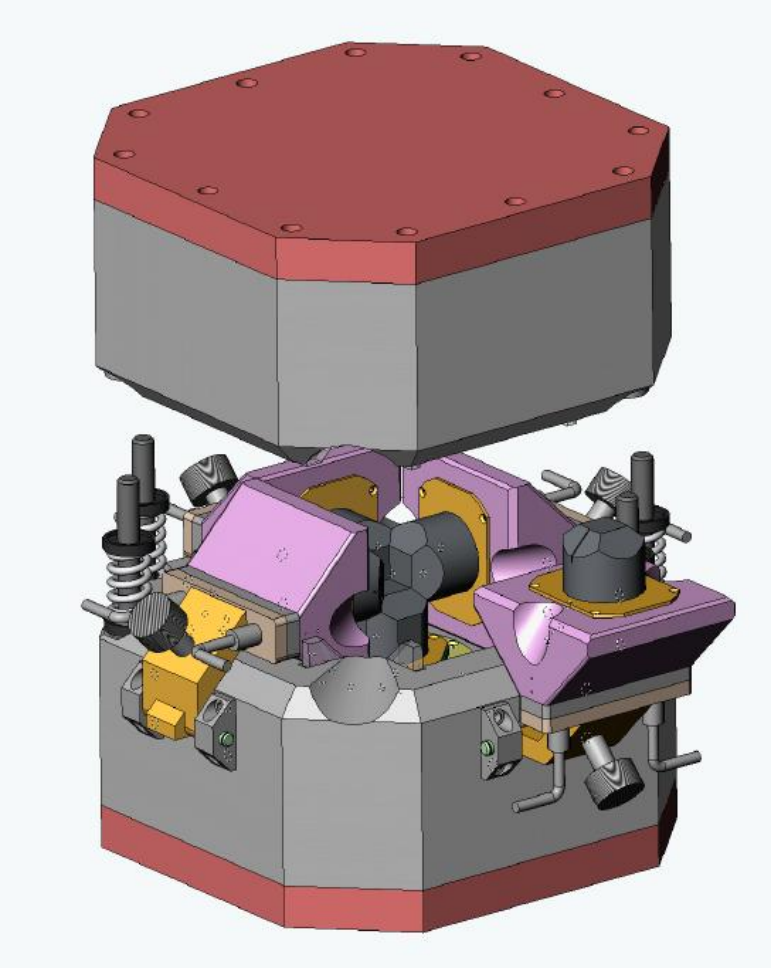
Complete Brillouin system combined with X-ray diffraction hardware



As installed at 13-BM-D beamline of GSECARS at the APS

D-DIA 30 project at the GSECARS beamlines at the APS under subaward to University of Chicago
[PIs: Wang, Lesher and Rivers]



D-DIA 30: Left in design-2007 Right ready for testing-Feb 2010

Workshop on Long Range Plan for High Pressure Earth Sciences

March 204, 2009 in Tempe, Arizona

Convened by J. Tyburczy, M. Brown and J .van Orman

The Tempe Report
[Q; Williams, EIC, in prep]
"Understanding the Building Blocks of the Planet:
The Materials Science of Earth Processes"

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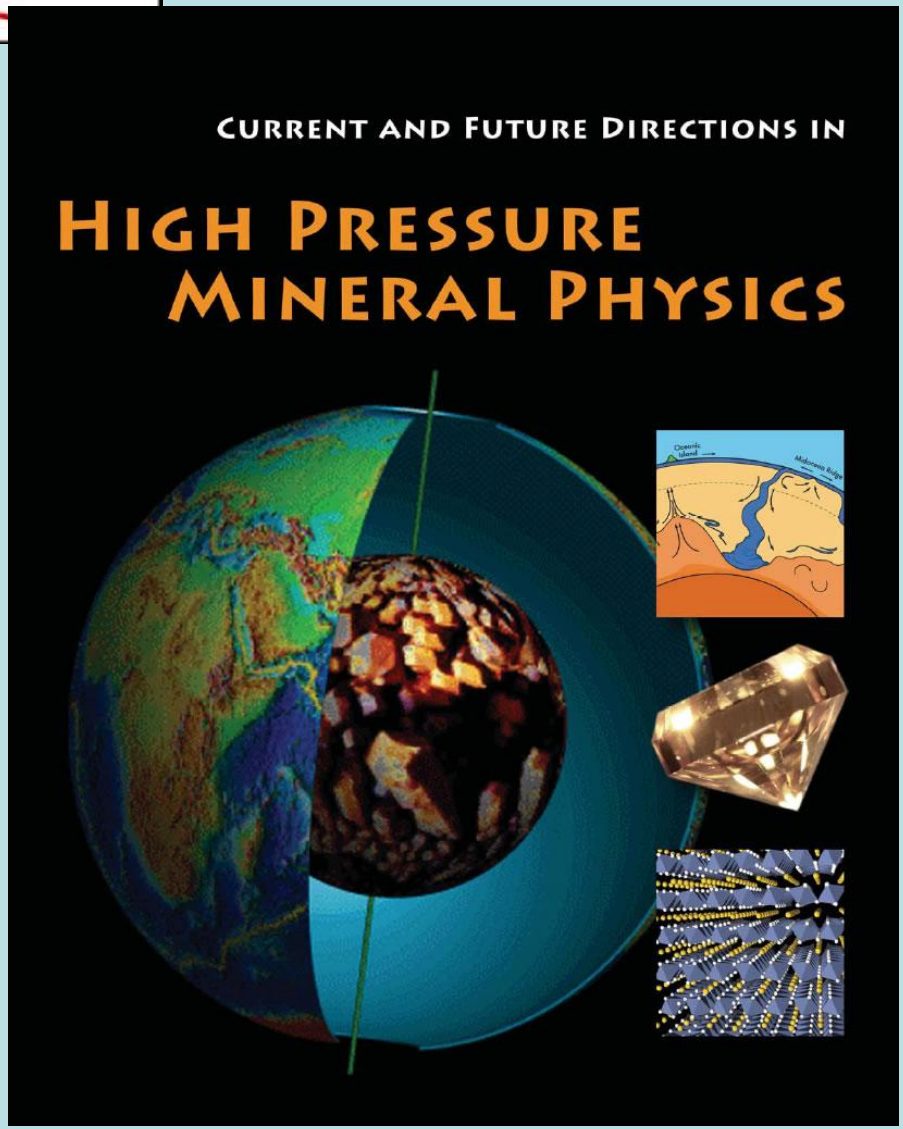

The “Bass” Report-2004

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Infrastructure Development

- **2002-2009**
  - **Development of the Laser-Heated Diamond Anvil Cell** [T. S. Duffy, Princeton University; G. Shen, Carnegie Institution of Washington; and D. Heinz, University of Chicago]
  - **Absolute Pressure and Temperature Calibration** [Y-b. Wang and M. L. Rivers, University of Chicago; and I. Getting, University of Colorado]
  - **Brillouin Spectroscopy at Advanced Photon Source** [J. D. Bass, University of Illinois at Urbana-Champaign]
  - **Inelastic X-ray Scattering at High Pressure & Temperature** [W. Sturhahn, Argonne National Laboratory; J.Jackson, California Institute of Technology, and J. D. Bass, University of Illinois at Urbana-Champaign]
  - **Pressure Calibration at High Temperature** [Y. Fei, Carnegie Institution of Washington]
  - **Development of CEAD (COMPRES Environment for Automated Data Analysis)** [S. Clark and P. Adams, Lawrence Berkeley National Laboratory, J. B. Parise, Stony Brook University, M.L. Rivers, University of Chicago; R. J. Angel and N. L. Ross, Virginia Polytechnic Institute and State University]
  - **Multi-Anvil Cell Assembly Initiative: New Developments and Production** [K. Leinenweber, J. A. Tyburczy, T. D.Sharp, Arizona State University]
  - **Calorimetry-on-a Chip** [A. Navrotsky, University of California at Davis; and Frances Hellman, University of California at Berkeley]•
  - **Gas-loading system for diamond-anvil cells at Advanced Photon Source** [M.L. Rivers and V. Prakapenka, University of Chicago]
  - **Monochromatic X-ray Side Station at Beamline X17B2 of the NSLS** [J. Chen, Stony Brook University]•
  - **Development of Next Generation Multi-Anvil Module for Megabar Research** [Y. Wang, University of Chicago, and Co-Is - C. Lesher, H. Green. Y. Fei, G. Shen, C. Agee, W. Durham and M. Manghnani]

Brillouin Spectrometer installed at APS

Installation of the Brillouin Spectrometer at the Advanced Photon Source in Fall 2004 by the Stas Sinogeikin and Jay from the University of Illinois at Urbana-Champaign with the assistance of Vitali Prakapenka of GSECARS.

Stas Sinogeikin, Jay Bass and Vitali Prakapenka installing the Brillouin spectrometer on beamline 13-BM-D at the APS.

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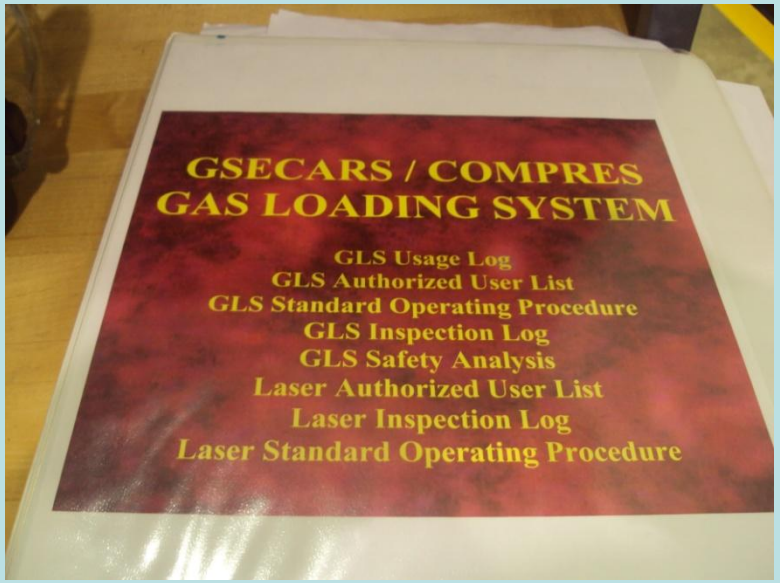
Visit to GSECARS at APS by COMPRES Leadership-Feb 2010



Mark Rivers of GSECARS describing features of the new gas-loading system for diamond-anvil cells to Jay Bass and Quentin Willams of COMPRES

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2008 Annual Meeting of COMPRES at Cheyenne Mountain Resort in Colorado Springs

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Lara O'Dwyer [UC Davis] presenting her poster at 2009 Annual Meeting of COMPRES in Bretton Woods, New Hampshire.

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With thanks to Jiuhua Chen from Florida International University for his Service as Editor

Earth Probe Newsletter

COMPRES

An NSF funded Consortium for Materials Properties Research in Earth Sciences

http://www.compres.us

Vol.8 No.1, May 2009, Stony Brook

Long Range Plan for High Pressure Earth Sciences Workshop

—Tempe, Arizona March 2 - 4, 2009

COMPRES Workshop

Eighty seven scientists from thirty nine institutions gathered at the Fiesta Resort in Tempe to discuss recent scientific successes of the high pressure mineral physics community and articulate directions of our research over the next decade. This two-day workshop featured nine plenary talks and breakout discussion sessions on four themes: 1) The Deeper Reaches of the Planet: Properties of Iron and its Alloys and the Novel Materials of the Deepest Mantle; 2) The Dynamic Ceramic Mantle; 3) Mineral Physics and Society; 4) Enabling Cutting-Edge Science: Tools and the Accomplishments they will drive in the Next Decade

In this issue

of Discovery. Participants of the workshop reviewed retrospective about how our field has impacted other subdisciplines of the earth sciences, including seismology, geodynamics and petrology. They also discussed perspective of high pressure Earth science: what are the next major breakthroughs of our community, and what infrastructure will be necessary to achieve them? While recognizing that incremental progress will occur, what new and different developments could occur? And, what long-standing problems might we solve? This is the second COMPRES workshop focusing on long range plan for high pressure Earth sciences. The first one "A Vision for High Pressure Earth and Planetary Sciences

(*continued on page 2*)

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COMPRES-related Workshops in 2008-2009

- **Workshop on Future Directions in High Pressure Research**
  National Synchrotron Light Source,
  Brookhaven National Laboratory, May 21, 2008.

- **Workshop to Introduce High-Resolution Inelastic X-ray Scattering on Earth Materials using Synchrotron Radiation,**
  held at the Advanced Photon Source,
  Argonne National Laboratory, May 31 - June 1, 2008

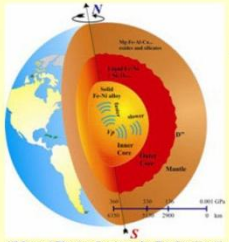
- **Workshop on Advances in High-Pressure Science Using Synchrotron X-rays held at the National Synchrotron Light Source**
  Brookhaven National Laboratory, October 4, 2008.

- **On-Line Brillouin Spectroscopy at GSECARS: Basic Principles and Application for High-Pressure Research.**
  held at the Advanced Photon Source,
  Argonne National Laboratory, Sept 23-25, 2009.

- **Workshop on Laser Heating the DAC: Where we are and where we are going?**

  Advanced Light Source of the Lawrence Berkeley National Laboratory

  December 12-13, 2009



"Mineral Physics Quest to the Earth's Core"
Leonid Dubrovinsky and Jung-fu Lin
EOS, January 20, 2009

COMPRES

www.compres.us

COnsortium for **M**aterials **P**roperties **R**esearch in **E**arth **S**ciences

Workshop on Long Range Plan for High Pressure Earth Sciences
Fiesta Resort and Conference Center
March 2 - 5, 2009

COMPRES is a community-based consortium whose goal is to enable Earth Science researchers to conduct the next generation of high-pressure science on world-class equipment and facilities. It facilitates the operation of beam lines, the development of new technologies for high pressure research, and advocates for science and educational programs to the various funding agencies.

COMPRES is supported by the Division of Earth Sciences at the National Science Foundation
via a Cooperative Agreement for the 5-year period
from 2007 to 2012 [EAR06 -49658].

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WORKSHOP: On-line Brillouin Spectroscopy at GSECARS: Basic Principles and Application for High Pressure Research
September 23-25, 2009
Advanced Photon Source
Argonne National Laboratory Chicago, IL
PDF

May, 2009 Newsletter

2009 COMPRES Annual Meeting

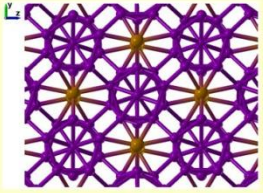
June 19 - 22, 2009

Mount Washington Resort - Bretton Woods, New Hampshire

Jackie Li and Harry Green selected as COMPRES Distinguished Lecturers for 2009-2010

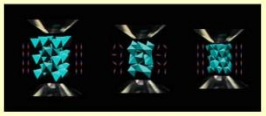
COMPRES: Recent Science Highlights

Discovery of a new partially ionic phase of boron
A. R. Oganov et al. from ETH-Zurich (now at Stony Brook University) and a team of co-authors
[in Nature, 2009]
Reporting work done at U2A and X17C at the NSLS



Summary (Word doc)
Article (pdf)
Posted 4/15/2009

Protean Magnetic Properties of Magnetic Oxide
S.-H. Dan Shim et al. from the Massachusetts Institute of Technology and co-authors
[in PNAS, 2009]
Reporting work done at XOR-3 at the APS with support from the NRIXS project at UIUC and ANL, and the GSECARS beamline at Sector 13.



Summary (Word doc)
Article (pdf)
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Archive of Science Highlights

Modified on May 29, 2009

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Consortium for Materials Properties Research in Earth Sciences

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Original Drawing Created by Keelin Murphy

2009 ANNUAL MEETING

June 19-22, 2009
Mount Washington Resort Bretton Woods, New Hampshire

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Welcome

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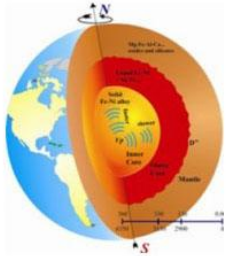
ANNOUNCEMENTS

COMPRES Workshop March 2-4, 2009

Distinguished Lecturers for 2009 - 2010: Jackie Li and Harry Green

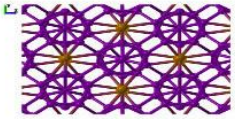
Quarterly Newsletter, May 2009 Issue

FEATURED ARTICLE



"Mineral Physics Quest to the Earth's Core"
Leonid Dubrovinsky & Jung-fu Lin
EOS
January 20, 2009

DISCOVERY OF A NEW PARTIALLY IONIC PHASE OF BORON



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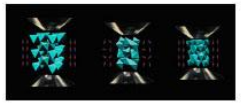
Posted 4/15/2009

PROTEAN MAGNETIC PROPERTIES OF MAGNETIC OXIDE



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from the University of Illinois at Urbana-Champaign

"Viewing deep inside the Earth with synchrotron X-rays"
"Using a 'pressure cooker' to simulate planetary evolution"

Harry Green

University of California Riverside

"How do earthquakes occur deep inside the Earth?"
"Up the Down Stair Case:
Deeply subducted rocks in continental collision zones"

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Bob-san in Japan in March 2009

Hiroshima University
Tutorial lecture series on
Mineral Physics to students
from
6 Japanese universities

Visit hosted by Jun-ichi Ando

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Bob-san in Japan in March 2009

L: with Tetsuo and his 2000- and 3000-ton presses

R: with 1500-ton "Madonna" press

L: With Toru Inoue And new 6000-ton Press

R: Toasting new Global Center of Excellence program at Ehime University

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Semi-Annual Newsletters of COMPRES
Edited by Jiuhua Chen from Florida International University

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Géophysique
L'intérieur de la Terre et des planètes
Agnès DEWAELE
Christine SANLOUP
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An International Magazine of Mineralogy, Geochemistry, and Petrology
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Accessing User Facilities
New Opportunities at Emerging Facilities
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Cooperative Studies of the Earth's Deep Interior
• DEVELOPMENTS
• DISCOVERIES
• FUTURE
Advances in HIGH-PRESSURE TECHNOLOGY FOR GEOPHYSICAL APPLICATIONS
Edited by
J. Chen, Y. Wang, T.S. Duffy, G. Shen and L.F. Dobrzhinetskaya
Journal of Synchrotron Radiation
Volume 12
Part 5
September 2005
Editors: Å. Kvick, D. M. Mills and T. Ohta
Structure Determination by Single-Crystal X-ray Diffraction at Megabar Pressures
Guest Editors: P. Dera, C. T. Prewitt and S. D. Jacobsen
International Union of Crystallography
IoP
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Condensed Matter

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Publications in mineral physics
By members of the
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June 2008:
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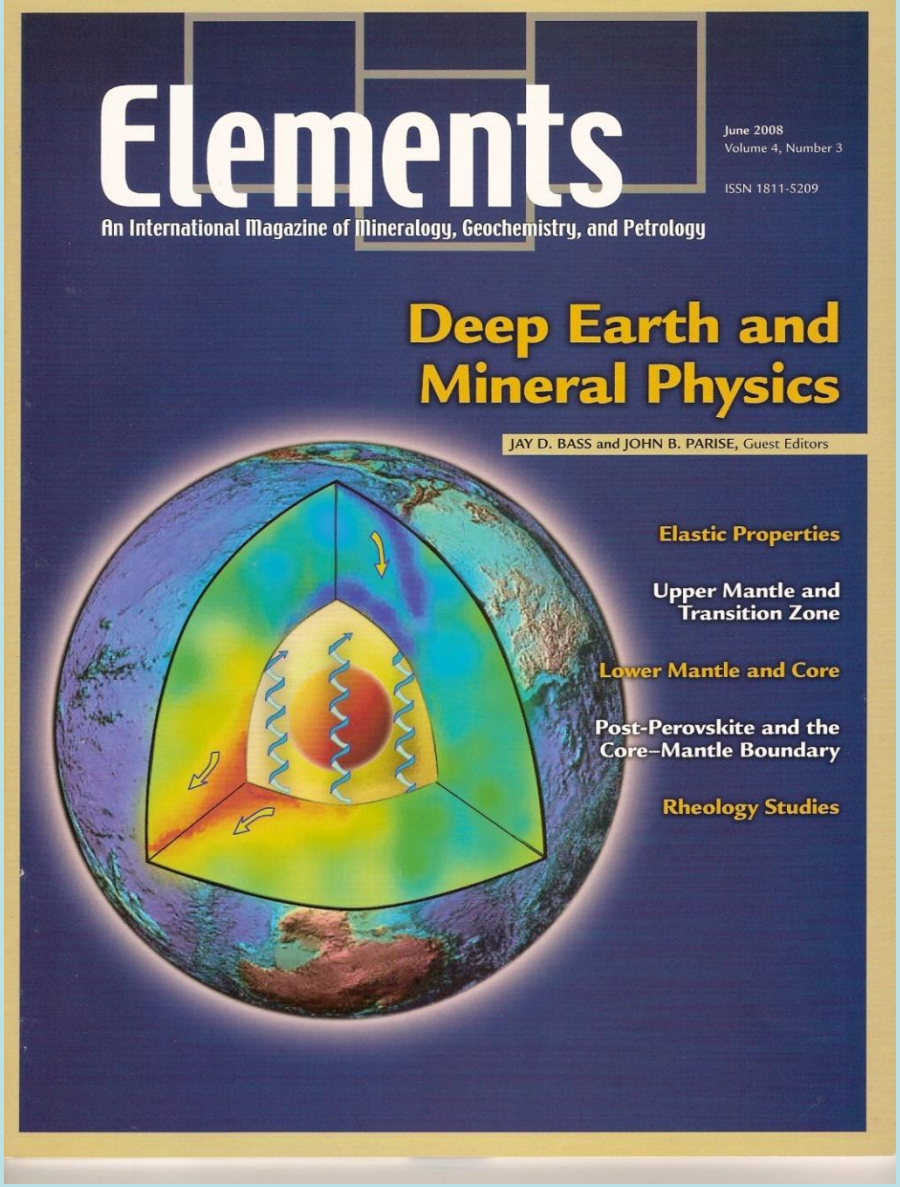
Jay Bass
and
John Parise



See also Special Issue of PEPI on
“Frontiers and Grand Challenges
in Mineral Physics of the
Deep Mantle”
Edited by Lin, Karato, Bass, Ohtani and Prewitt

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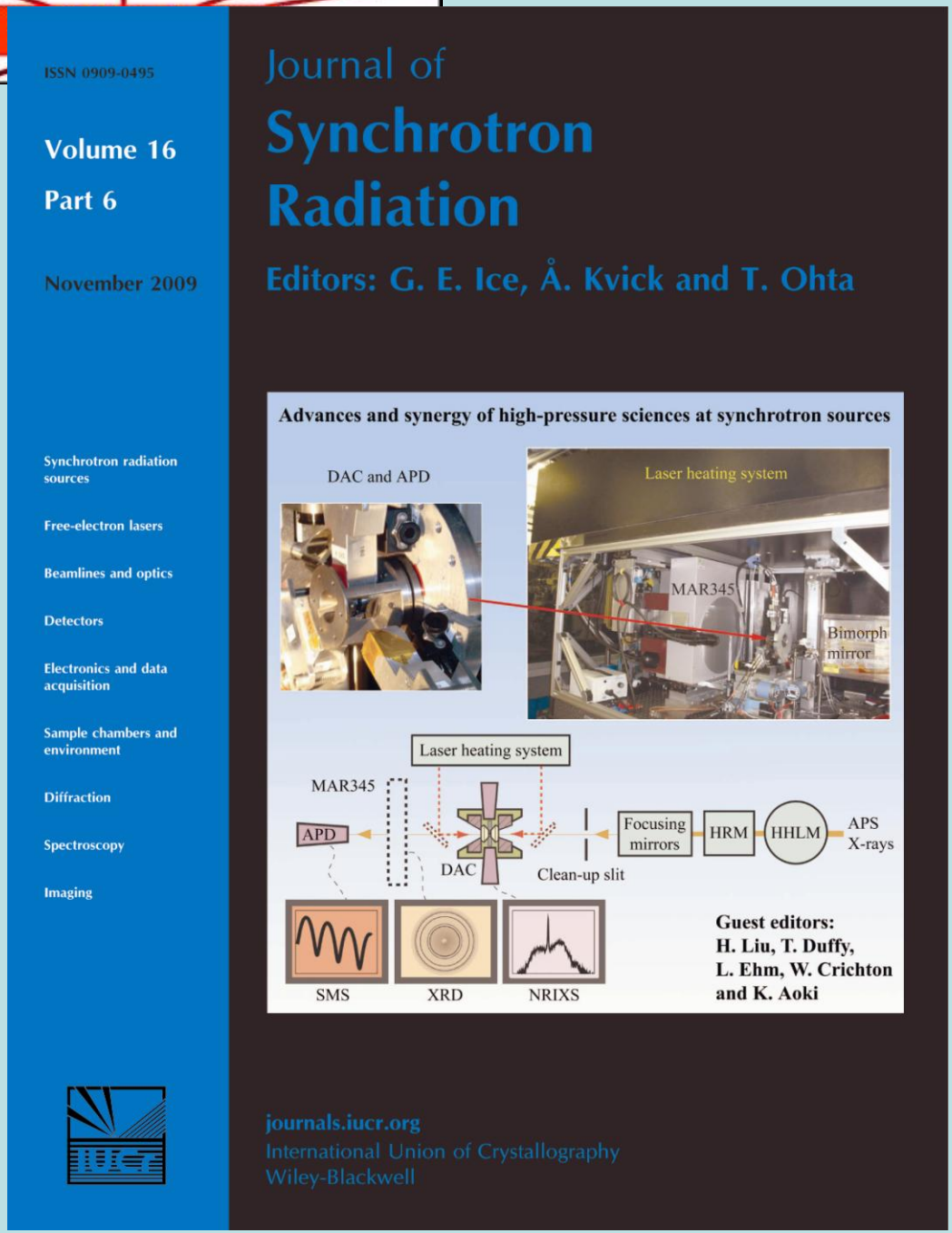


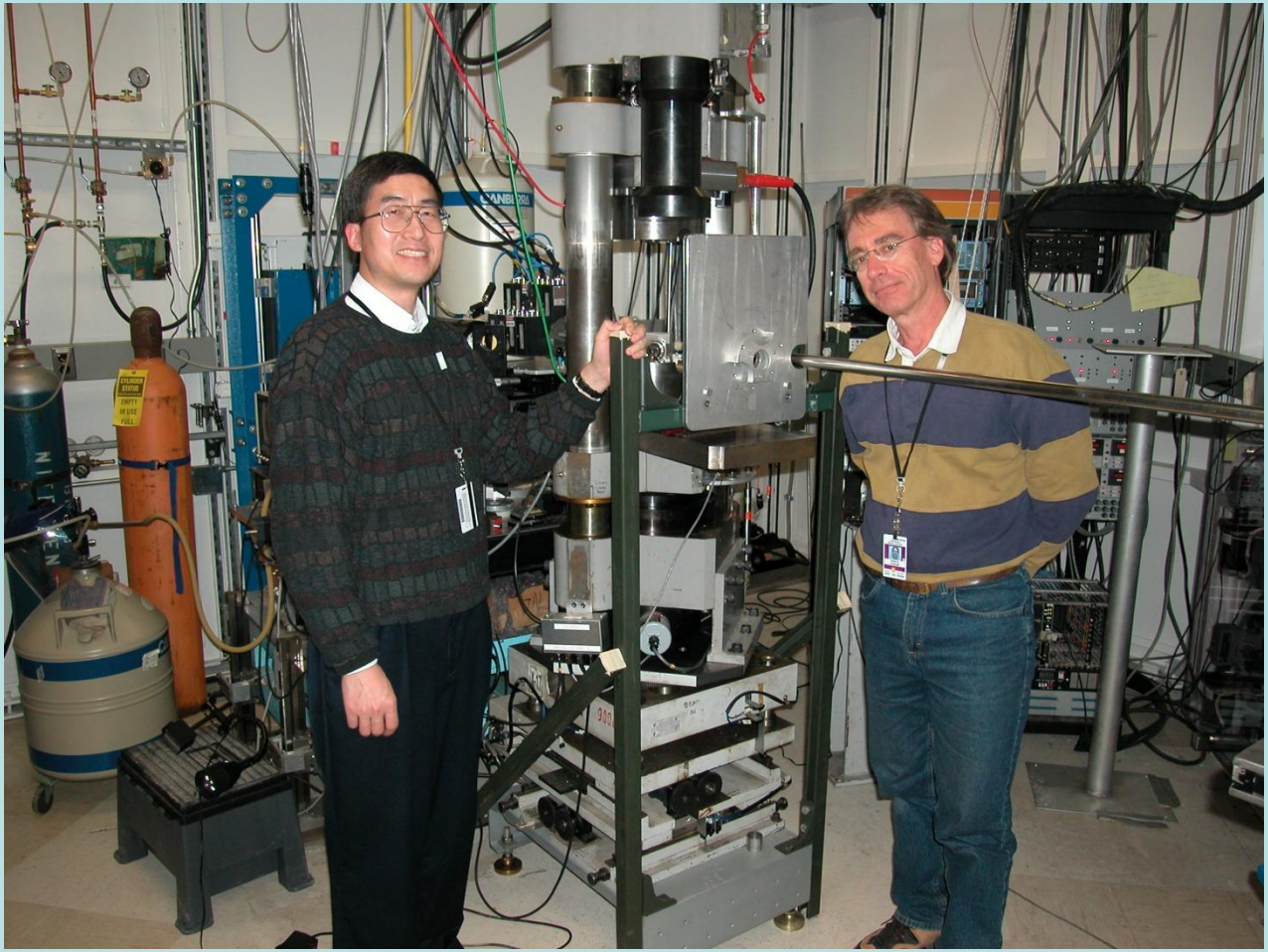
November 2009
Issue of
J. Synchrotron Radiation

Edited by
Haozhe Liu,
G. E. Ice, A. Kvick
And T. Ohta

Rotational Drickamer Apparatus on X17B2 Beamline at NSLS

William Landuyt and Phil Skemer from Karato research team at Yale

D-DIA on X17B2 Beamline at NSLS



Shenghua Mei-Minnesota and Bill Durham-MIT

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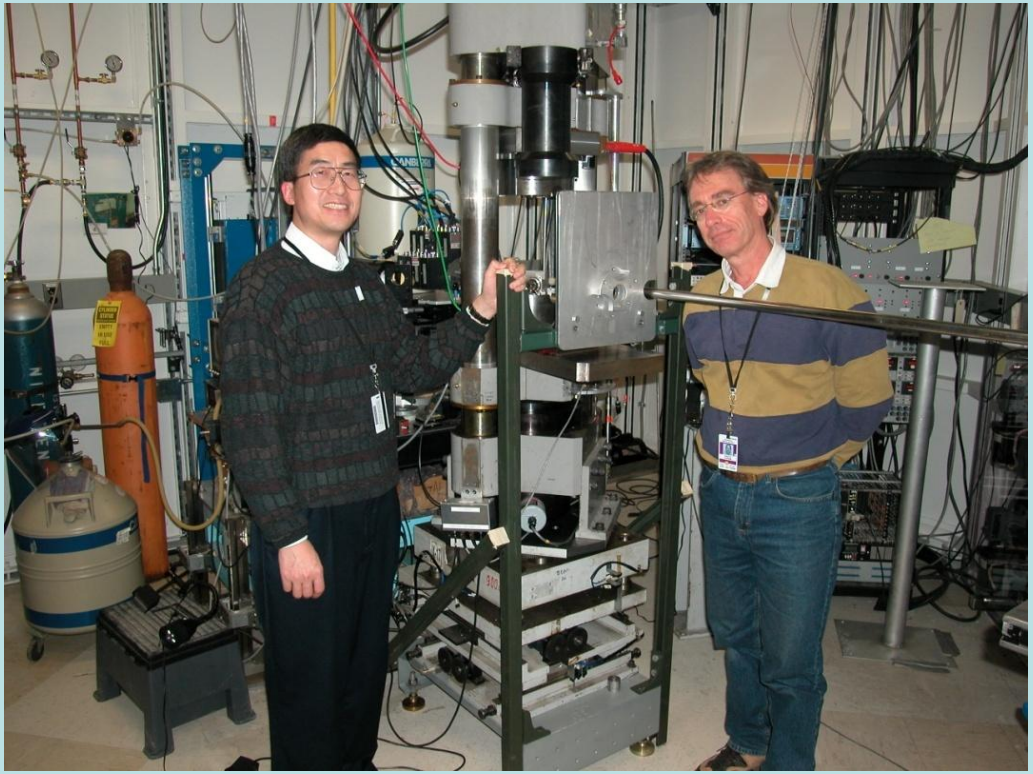
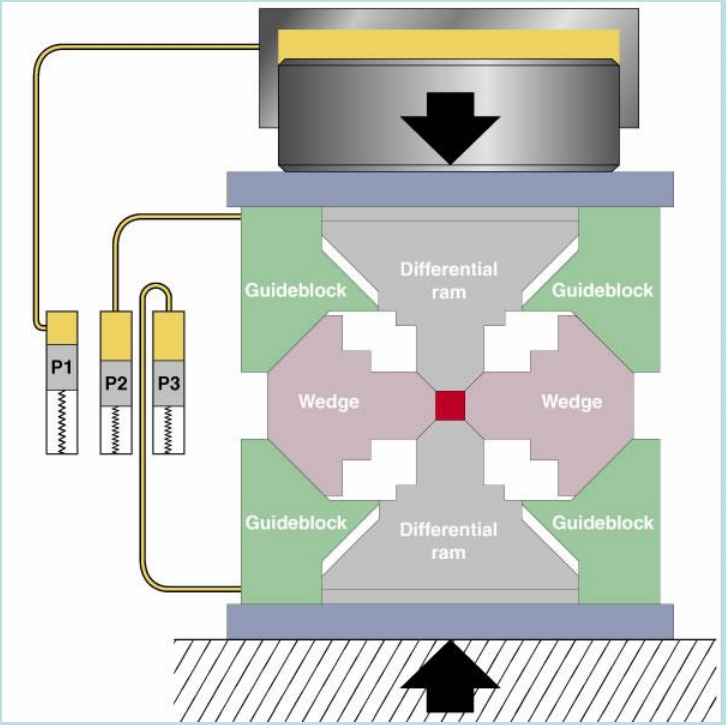
D-DIA Apparatus [SAM-85] at X17B2 Beamline at the NSLS





Shenghua Mei-Minnesota and Bill Durham-MIT Deformation-DIA apparatus

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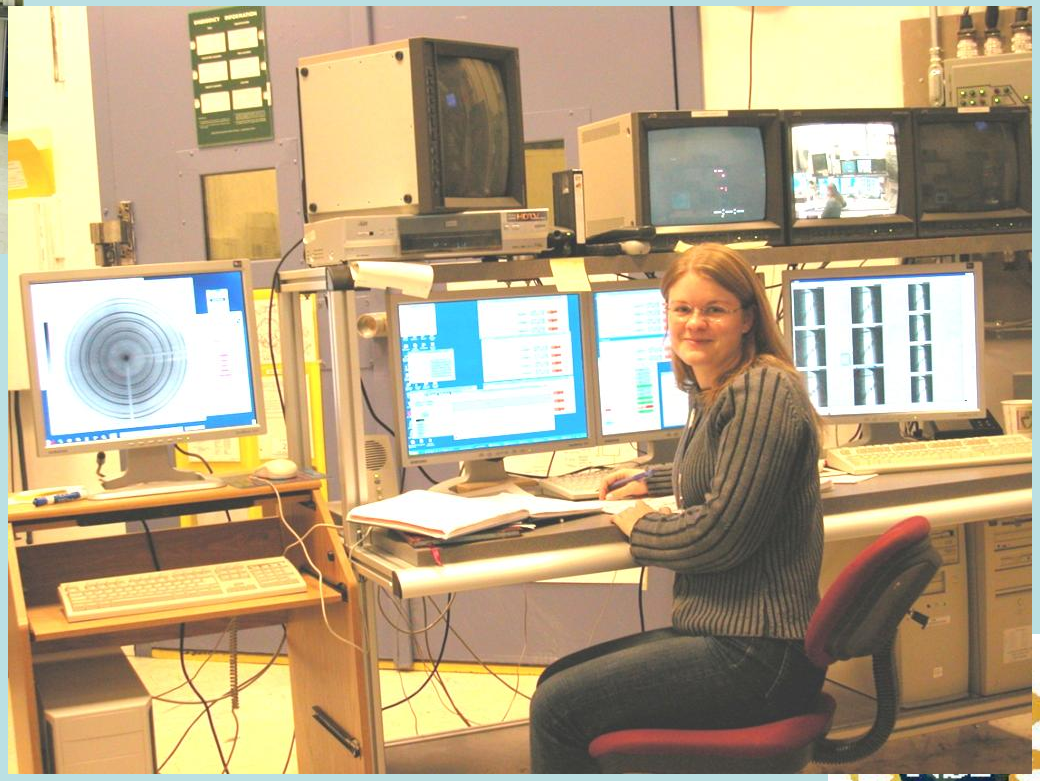
Monochromatic Side-Station at Beamline X17B2 at the NSLS under subaward to Stony Brook University [PI: J. Chen]

Carey Koleda adjusting monochromator

Héléne Couvy and 1st expeiment



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REU Summer Scholars at X17B2
Multi-Anvil Beamline of the NSLS in 2004

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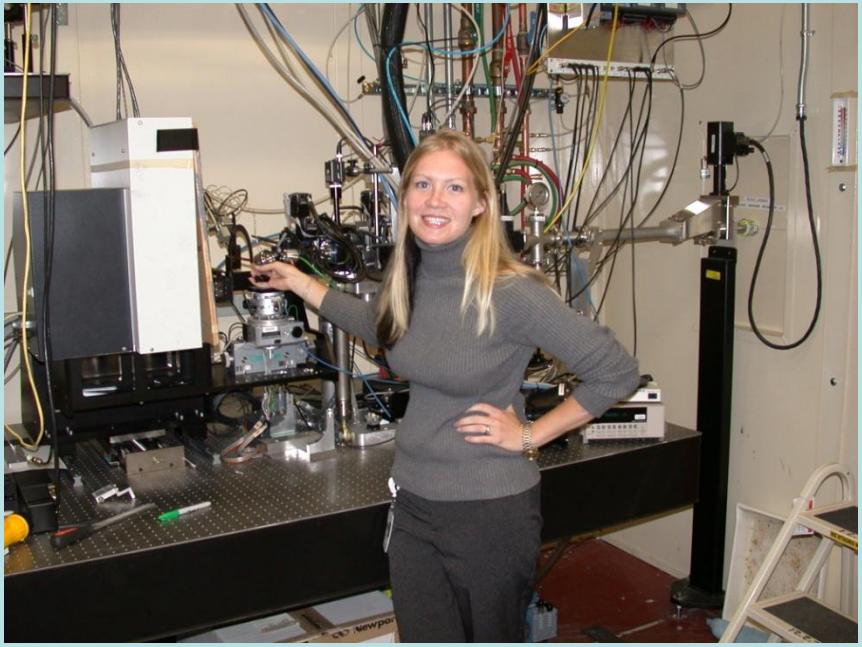
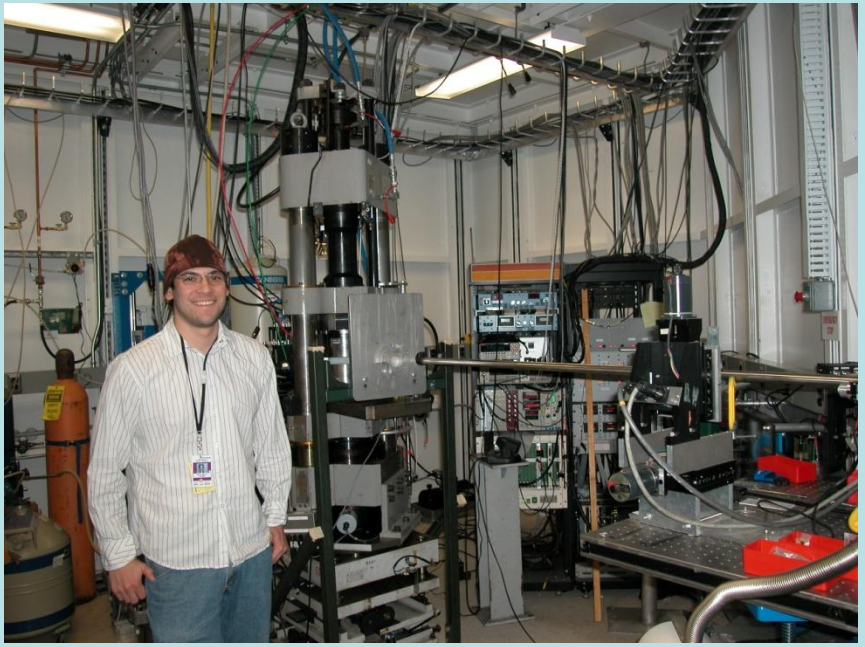
COMPRES undergraduate student interns





Undergraduate Interns Arianna Gleason from University of Arizona
at beamline 12.2.2 of the ALS and Christopher Young from University of CaliforniaDavis at the X17B2 beamline at the NSLS in 2004-2005

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Beamline 12.2.2 at ALS

COMPRES users start using beamline 12.2.2 at the ALS

Although commissioning of the new high-pressure beamline at the ALS is not due to be completed until the end of the year COMPRES users have already started collecting diffraction data. Below are pictures Abby Kavanar and Nathalie Conil from UCLA collecting radial diffraction data on water samples. End station 1, equipped with resistive heating dacs, is now fully commissioned for diffraction experiments. End station 2, equipped with laser heating, will be commissioned for diffraction next month. Updates and details of how to obtain beam time on this new facility can be found on the beam line website: http://xraysweb.lbl.gov/bl1222/home.htm.

Abby Kavner and Nathalie Conil from UCLA

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Career Path for African-American Students from HBCUs to National Laboratories

*MS in Geoscience Instrumentation at Stony Brook University
*Research Internship at NSLS of Brookhaven National Laboratory
*Collaborate with:
INCREASE: Interdisciplinary Consortium for Research and Educational Access in Science and Engineering*
Center for Inclusive Education at Stony Brook

July 2008 INCREASE Workshop at National Synchrotron Light Source

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Wendy Panero
The Ohio State University

"Anisotropic Fabric of the Earth's Inner Core"

"Water Cycling and Storage in the Earth's Deep Interior"

James Van Orman
Case Western Reserve University

"Chemistry at the core-mantle boundary"

"Diffusion in Earth's deep interior: Insights"

Please contact COMPRES to apply for a visit.
COMPRES will cover all costs.


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Teaching Mineral Physics across the Curriculum

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Students at synchrotrons of DOE national labs—Beamline X17C of NSLS

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REU Summer Scholars Program- Beamline X17B2 of NSLS

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Rotational Drickamer Apparatus on X17B2 Beamline at NSLS

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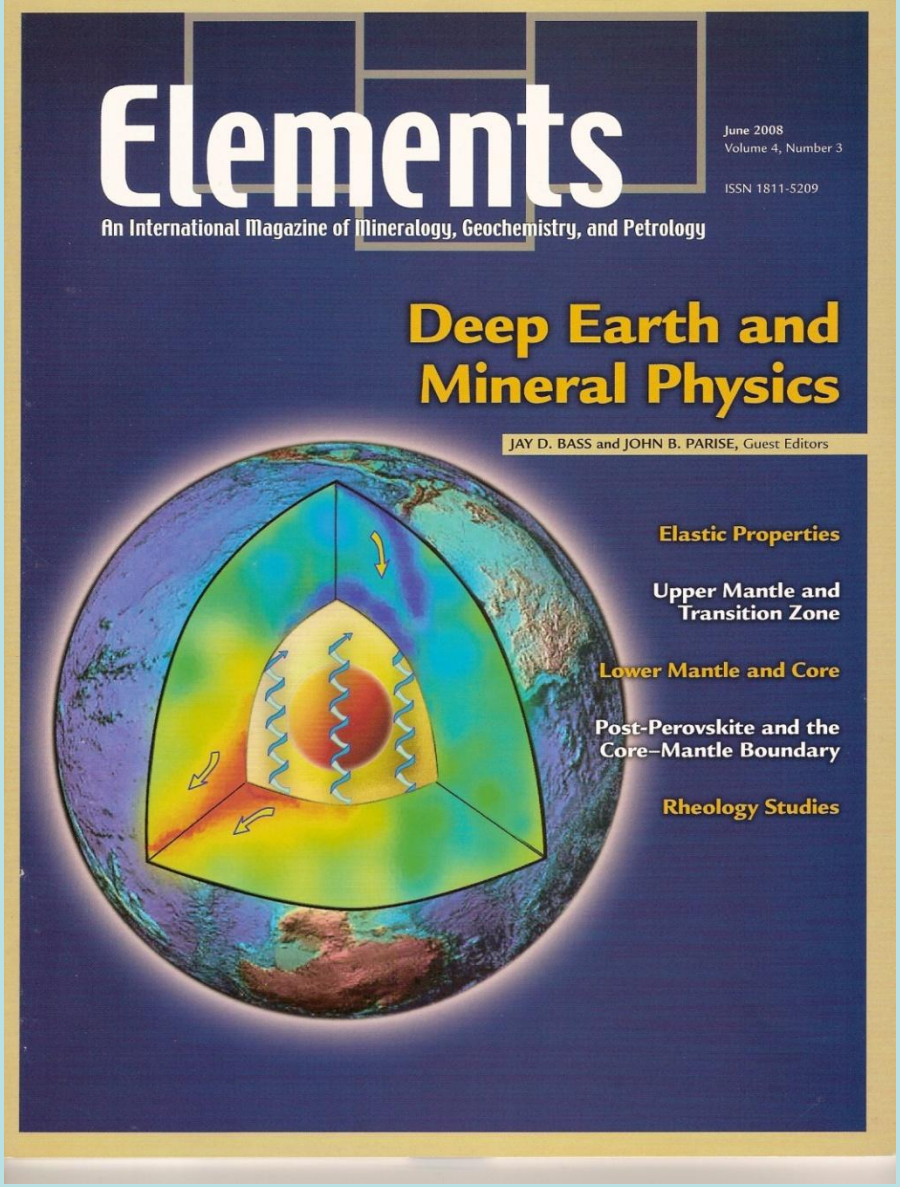

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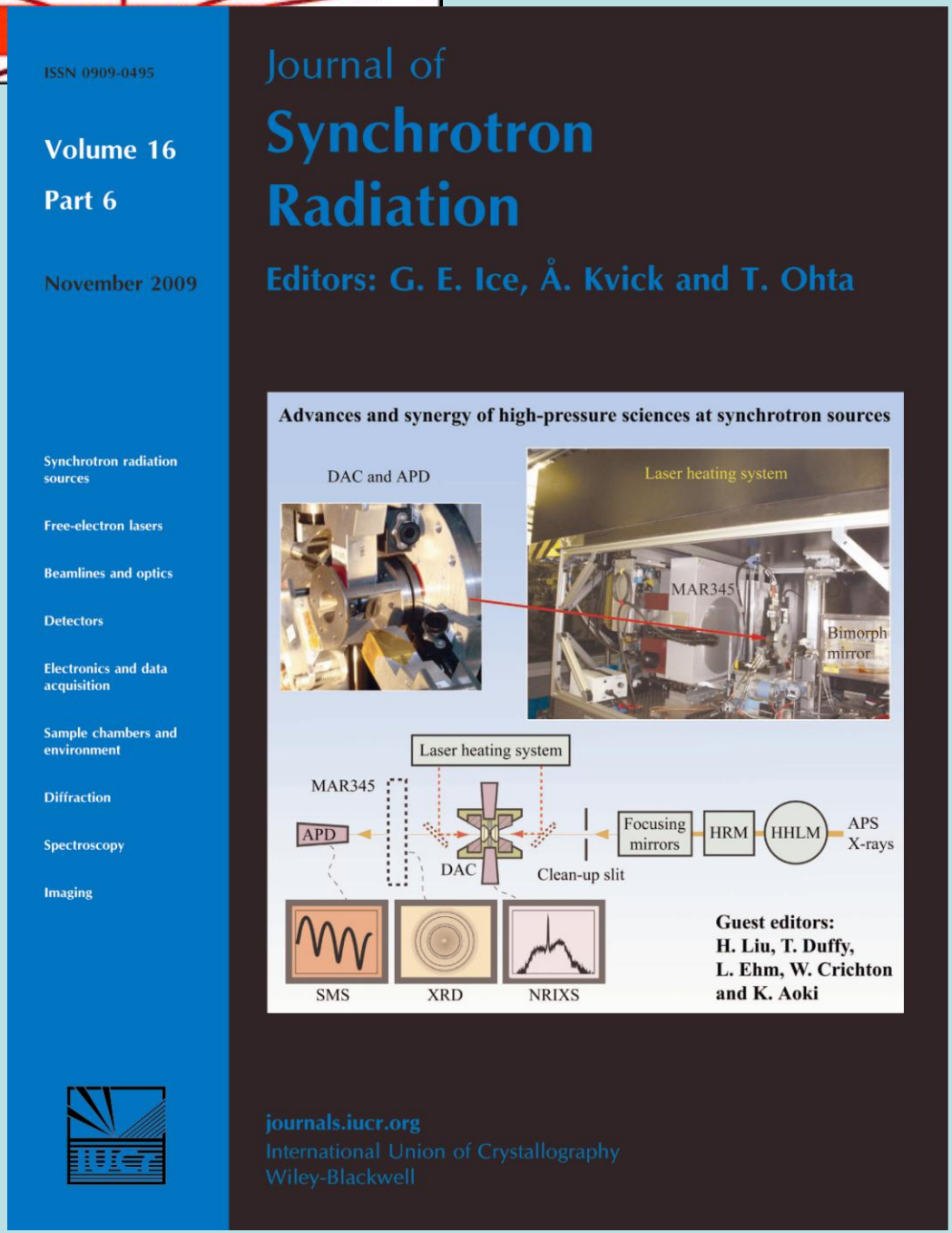

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Marc Hirschmann from University of Minnesota lecturing on “Deep Earth Volatiles” at Long-Range Planning Workshop in Tempe, Arizona, in March 2009.

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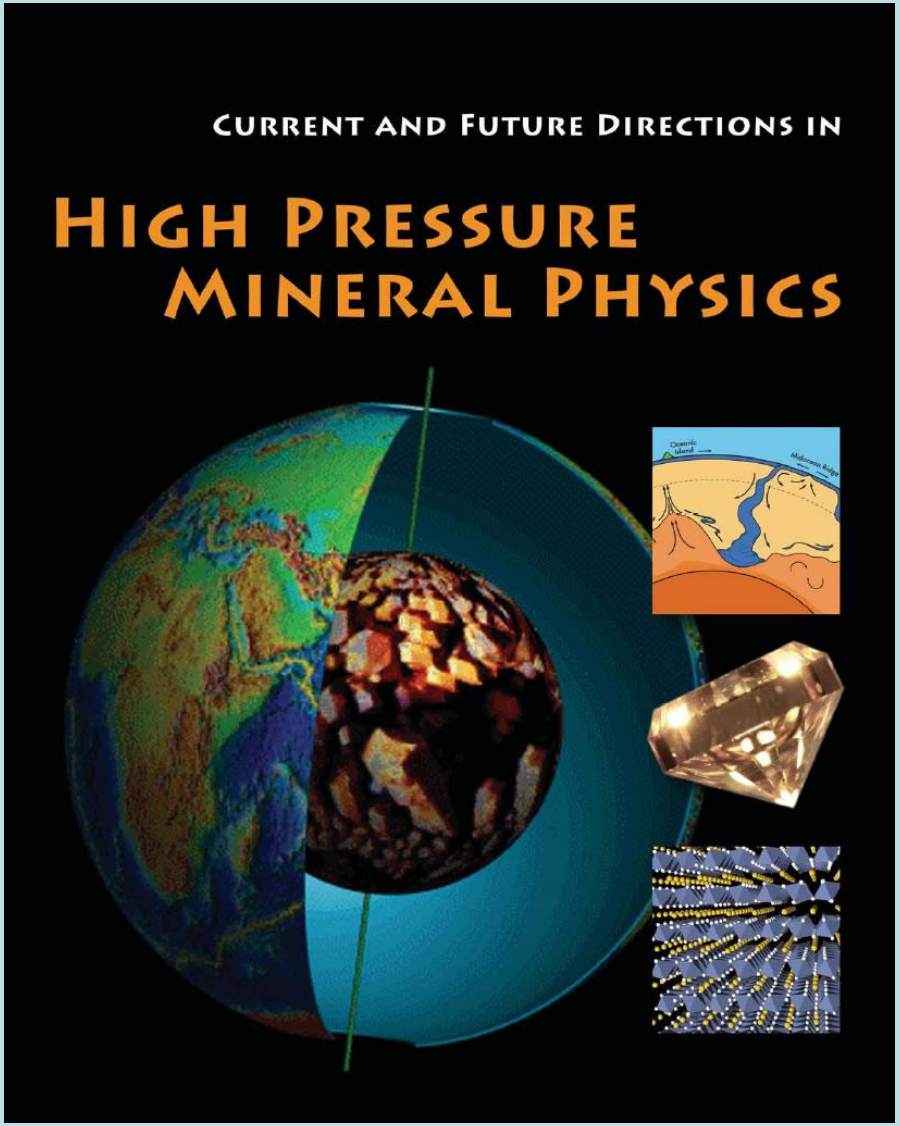

The “Bass” Report-2004

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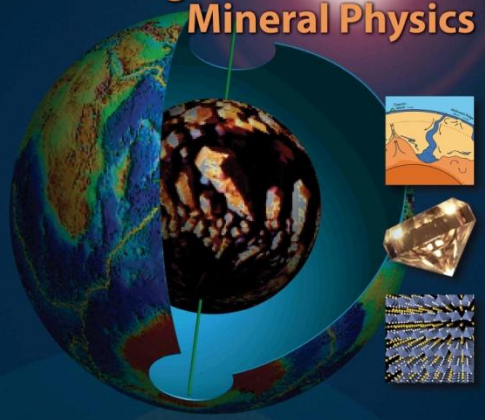
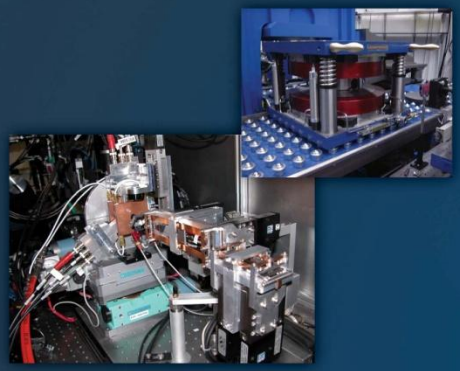
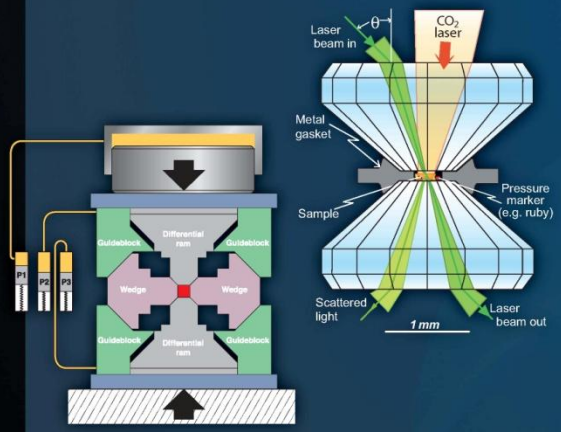
Current and Future Research Directions in

High-Pressure Mineral Physics



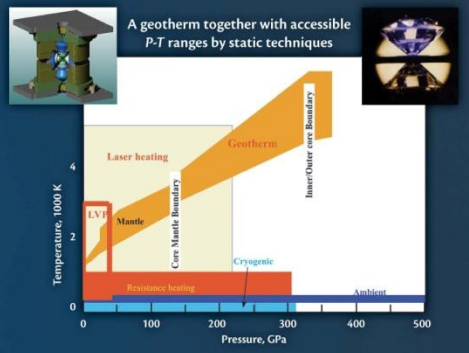
The field of high-pressure mineral physics is highly interdisciplinary, encompassing the full range of chemical and physical (even biological) processes that take place at high pressures beneath the surfaces of planets. These processes span the range of conditions within Earth's interior, from generation of the magnetism in Earth's core at pressures of over 1.3 million atmospheres, to methane production by microbes at modest pressures in ocean sediments.

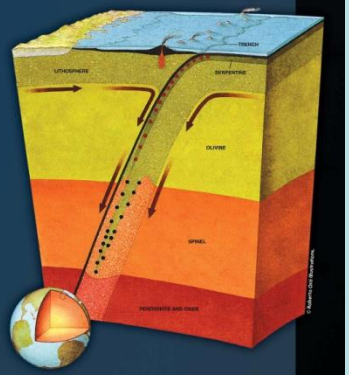




Technology

Inventing new tools to understand Earth and the deep interiors of other planetary bodies.





Science

Understanding how planetary systems operate and their evolution over time.

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Consortium for Materials Properties Research in Earth Sciences

A community-based organization to promote and facilitate high-pressure research in the science of Earth and planetary materials. COMPRES operates high-pressure beamlines for Earth sciences at national synchrotron and neutron facilities and supports the development of new technologies for high-pressure research. COMPRES is funded by the National Science Foundation Division of Earth Sciences. Copies of the report, "Current and Future Directions in High-Pressure Mineral Physics," are available at www.compres.us.

Poster based on Bass Report

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